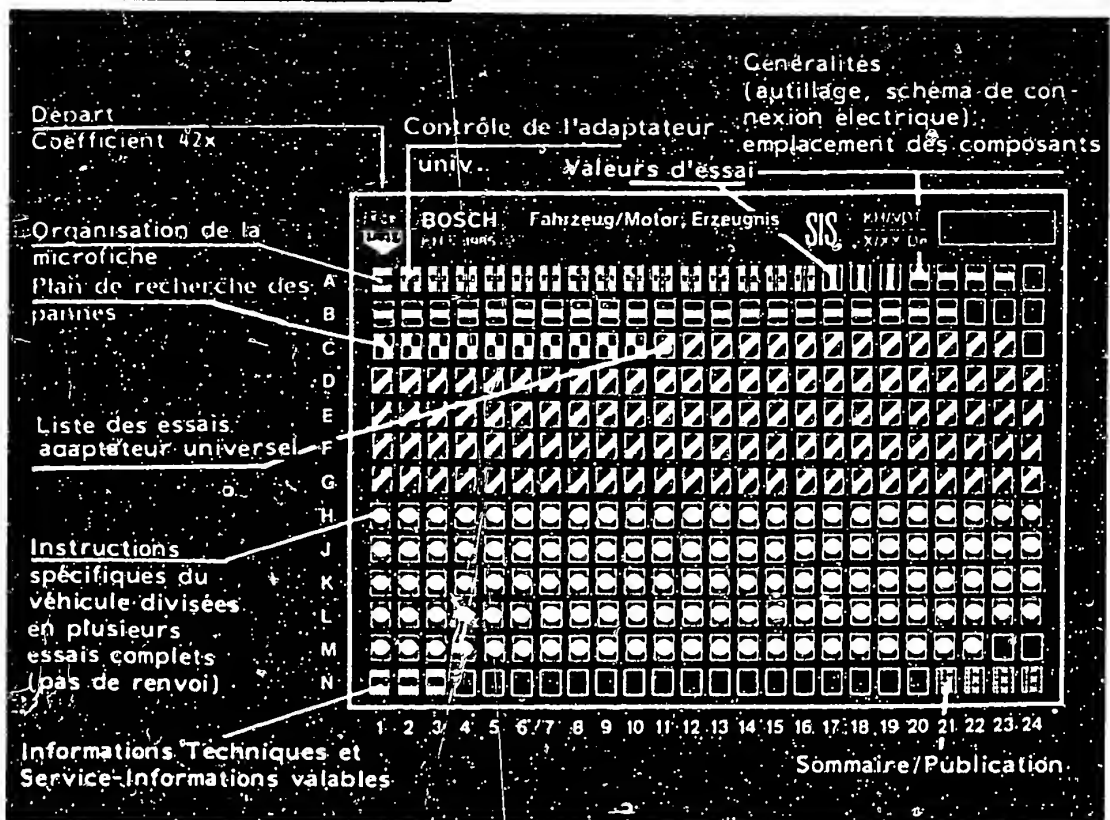


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

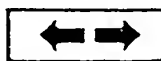
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

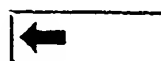
3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

<b>A1</b>	Trouble-shooting program	
-----------	--------------------------	--

## SPECIAL FEATURES

This microcard contains the testing and repair instructions for the Motronic in the following BMW models for the USA and Japan (J):

- 528e (as of 9.81)
- 533i (from 6.83 in USA to 10.84)
- 633 CSi (from 9.81 in USA to 10.84)
- 732i for Japan (as of 9.81)
- 733i for USA (from 9.81 to 10.84).

The models 732i (J) and 733i (USA) are identical. All versions contain lambda closed-loop control and an external idle speed control (non-Bosch product).

### 1. RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic expert to quickly check the electrical part of the system with the universal test adapter.












The rapid diagnosis chart contains the following information:

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Readings on the multimeter and motortester
- References to coordinates of the respective detailed testing and trouble-shooting program.

If detailed information and instructions are required, always proceed in accordance with the trouble-shooting program starting on Coordinate C1.

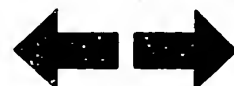


# Rapid diagnosis chart for universal test adapter

Test step	Switch position		Remarks	Test specifications (Reading)	for trouble-shooting see Coordinates
	V	$\Omega$			
1		1	Shift gear to neutral. Ignition off. Disconnect control units for Motronic and idle speed control as well as pump relay. Measure insulation resistance of engine-speed sensor term. 8 to term. 5.	greater than 1 M $\Omega$	C 14
2		2	Measure insulation resistance of reference-mark sensor term. 25 against term. 5.	greater than 1 M $\Omega$	C 18
3		3	Measure winding resistance of engine-speed sensor term. 8 against term. 27.	0.6 ... 1.6 k $\Omega$	C 22
4		4	Measure winding resistance of reference-mark sensor term. 25 against term. 26.	0.6 ... 1.6 k $\Omega$	D 3
5		5	Measure resistance of engine temperature sensor (NTC II) term. 13 against term. 5.	at +15°C to +30°C: 1.45 ... 3.3 k $\Omega$ (temperature-dependent)	D 7
6		6	Measure resistance of air temperature sensor (NTC I) term. 22 against term. 5.	at +15° to +30°C: 1.45 ... 3.3 k $\Omega$ (temperature-dependent)	D 9
7		7	Measure lead resistance term. 10 against term. 5. Lead must not be connected.	$\infty \Omega$ less than 10 $\Omega$	D 11
8		8	not applicable	-----	-----
9		9	Accelerator in rest position. Measure resistance of idle contact term. 2 against term. 5.	less than 10 $\Omega$	D 13
10		10	Accelerator in full-load position. Measure resistance of full-load contact term. 3 against term. 5	less than 10 $\Omega$	D 17-
11		11	Measure resistance. Ground term. 16 against term. 5	less than 10 $\Omega$	D 19

**A3**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



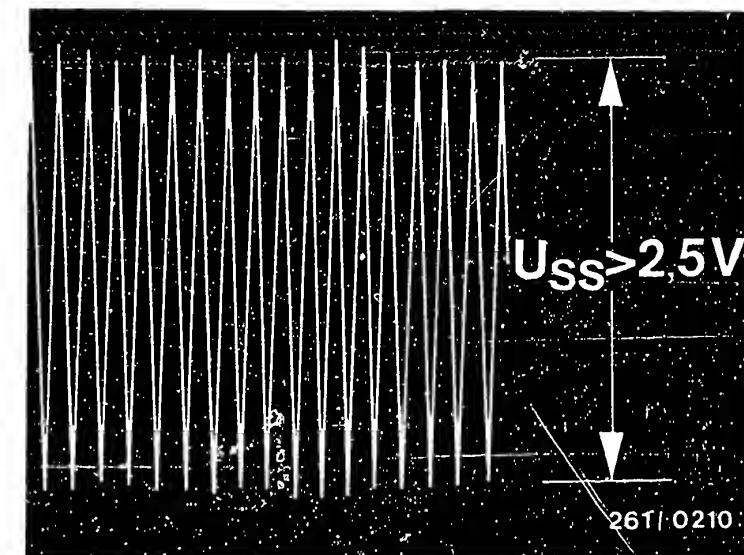
**A4**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



# Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specifications (Reading)	For trouble-shooting see Coordinates
	V	$\Omega$			
12	↓	12	Measure resistance Ground term. 17 to term. 5	less than 10 $\Omega$	D 21
13	↓	13	Measure resistance. Ground term. 19 to term. 5	less than 10 $\Omega$	D 23
14/1	↓	14	If applicable, measure resistance of altitude sensor (pressure sensor). Term. 30 to term. 5.	0.4 ... 2.3 k $\Omega$ dependent on altitude	E 1
14/2	↓	14	Caution: If applicable, measure voltage of altitude sensor (pressure sensor) at $\Omega$ sockets. Readings are dependent on altitude and battery voltage. Battery voltage between 10 and 14 V. Measure- ment at term. 30 and term. 5. Switch on ignition.	0 m: 1.5 ... 3.5 V 500 m: 2.5 ... 5 V 1000 m: 3.5 ... 6 V 1500 m: 4.5 ... 7.5 V	E 3
15/1	↓	15	If applicable, measure resistance of lead for altitude compensation. Term. 28 to term. 5.	less than 10 $\Omega$	E 5
15/2	↓	15	If applicable, measure resistance of altitude sensor (switch) term. 28 to term. 5. Switch closed (above 1000 m altitude):  Switch open (below 1000 m altitude):	less than 10 $\Omega$  $\infty \Omega$	E 7
16	1	15	Measure signal with oscilloscope. Engine-speed sensor term. 8 to term.27. Connect control unit for idle speed control. Shift gear to neutral and start.	see top diagram	E 9



Engine-speed sensor signal

**A5**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



**A6**

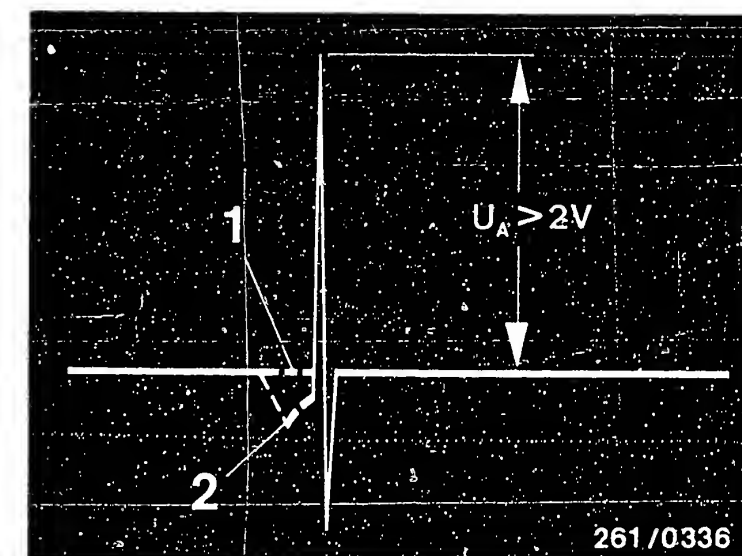
Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)





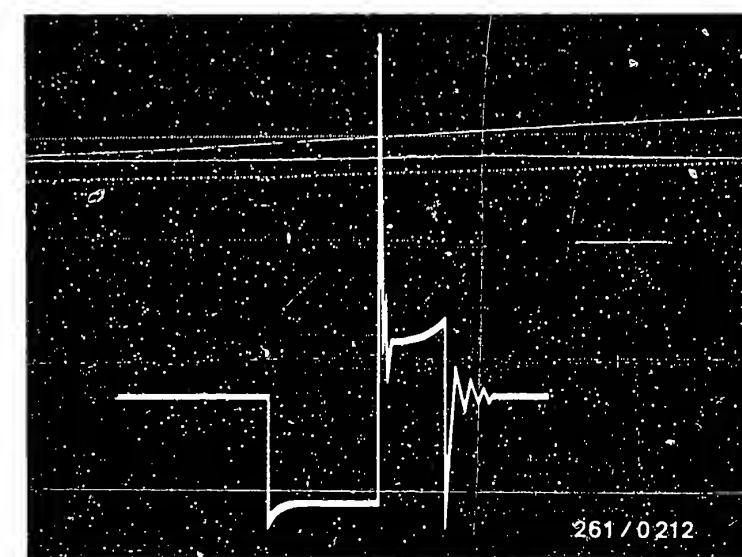
# Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specifications (Reading)	For trouble-shooting see Coordinates
	V	$\Omega$			
17	2	15	Measure signal with oscilloscope at reference-mark sensor term. 25 to term. 26. Shift gear to neutral and start.	see top diagram	E 14
18/19	3/4	15	not applicable	-----	-----
20	6	15	Measure voltage at main relay term. 35 to term. 5.	<u>10 ... 15 V</u>	E 19
21	7	15	Measure voltage at main relay term. 18 to term. 5.	<u>10 ... 15 V</u>	E 21
22	5	15	Ignition off. Connect control unit for Motronic. Ignition on. Measure ignition signal with oscilloscope. Shift gear to neutral and start. Control unit, ignition stage term. 1 to term. 5. Evaluation: Signal present.	see bottom diagram	E 23



Reference-mark sensor signal  
1=Automatic transmission  
2=Manual transmission

Ignition signal



**A7**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



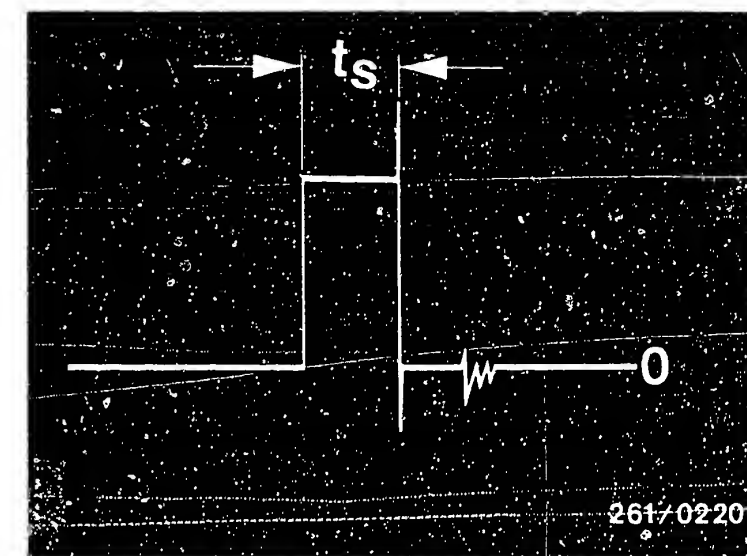
**A8**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



# Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test speci-fications (Reading)	For trouble-shooting see Coordinates
	V	$\Omega$				
23	8	15		Measure voltage at control unit term. 9 to term. 5.	<u>greater than 8 V</u>	F 1
24	9	15		Measure voltage at air-flow sensor term. 7 to term. 5.		F 3
				Sensor flap in rest position:	<u>150...250 mV</u>	
				Sensor flap open as far as it will go:	<u>greater than 7 V</u>	
25/26	10/11	15		Not applicable	-----	---
27	12	15		Measure voltage. Starting signal term. 50. Term. 4 to term. 5.	<u>8 ... 15 V</u>	F 5
28	13	15		Measure dwell period $t_s$ from control unit with oscilloscope <sup>s</sup> term. 21 to term. 5. Shift gear to neutral and start.	<u>see diagram</u>	F 7



$t_s$  = Dwell period

0 = Base line

**A9**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



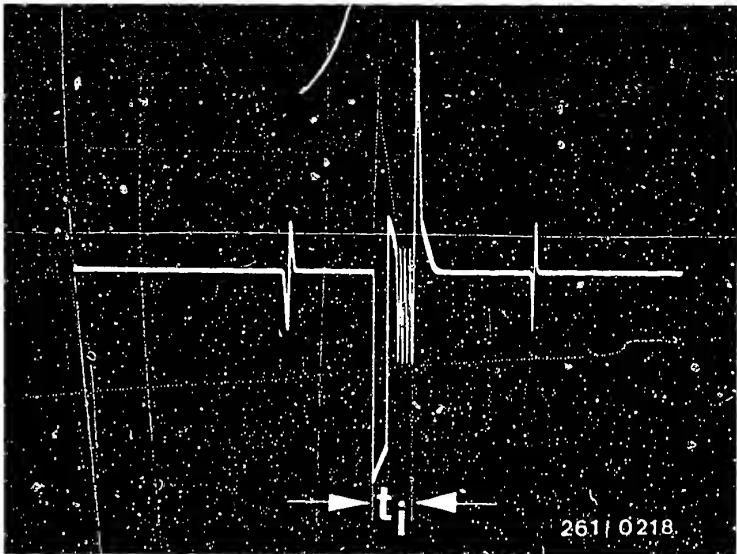
**A10**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)

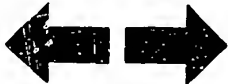
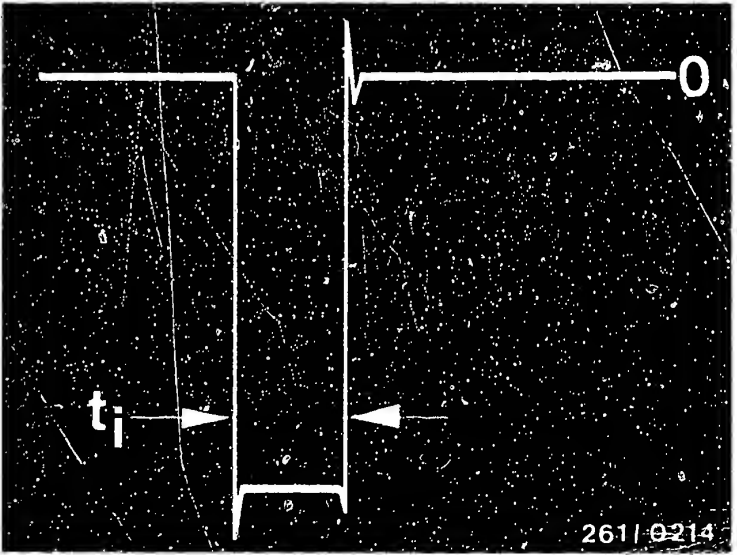


Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test speci-fications (Reading)	for trouble-shooting see Coordinates
	V	Ω				
29	14	15		Measure injection signal $t_i$ of control unit with oscilloscope term. 14. against term. 5. Shift gear to neutral and start.	see top diagram	F 9
30	14	15	T1	As 29, but after pressing button (NTC II, cold) duration of injection becomes slightly longer.		F 11
31	15	15		As test step 29, but test term. 15 against term. 5.		F 13
32	16	15		Measure injection signal $t_i$ of control unit with oscilloscope term. 11 against term. 5. Shift gear to neutral and start.	see bottom diagram	F 15



$t_i$  = Injection signal



# Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test specifications (Reading)	For trouble-shooting see Coordinates
	V	$\Omega$				
33	17	15		Measure voltage at control unit term. 20 to term. 5. (Object under test: Pump relay coil). Connect pump relay. Switch on ignition.	<u>10 ... 15 V</u>	F 17
34	17	15		Measure voltage at control unit term. 20 to term. 5. (Object under test: Pump control in control unit). Shift gear to neutral and start.	<u>max. 4 V</u>	F 19
35	17	15	T3	Ignition off. Connect pressure gauge. Switch on ignition. Press button T3. Read off fuel pressure.	<u>2.3 ... 2.7 bar</u>	F 21
36	17	15		Connect motortester, diagnostic cable and CO analyzer before catalytic converter. Disconnect tank vent hose and lambda sensor. Switch off all electrical devices. Check idle speed and CO with engine at normal operating temperature.	<u>650 ... 750 min<sup>-1</sup></u> <u>0.2 ... 1.2 vol.%CO</u>	G 3
37	17	15		Let engine run. Check spark advance at idle speed. Important: Idle speed must be between 650 and 750 min <sup>-1</sup> , otherwise different spark advance angles will be indicated. If idle speed fluctuates, spark advance will also fluctuate.	<u>5° ... 15°</u> at idle speed. For control unit 0 261 200 021 and ... 027 there applies: <u>3° ... 13°</u>	G 8
	17	15	T6	Check spark advance at full load. Set engine speed 3000 min <sup>-1</sup> /4500 min <sup>-1</sup> and press T6 (full-load button). For checking, cool engine with an auxiliary blower. Intake air temperature must not exceed +30°C.	528e: <u>8° ... 18°</u> at 3000min <sup>-1</sup> 533i, 633CSi, 733i: <u>15° ... 25°</u> at 4500 min <sup>-1</sup>	
38	17	15		Dwell angle at idle speed	<u>8° ... 18°</u>	G 10
				Dwell angle at 3000 min <sup>-1</sup>	<u>22° ... 42°</u>	

**A13**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



**A14**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)

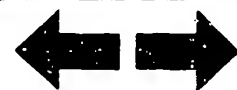


# Rapid diagnosis chart for universal test adapter (continued)

<u>Test step</u>	<u>Switch position</u>		<u>But-ton</u>	<u>Remarks</u>	<u>Test specifications (Reading)</u>	<u>For trouble-shooting see Coordinates</u>
	V	$\Omega$				
39	17	15	T5	Hold engine speed constant at 2000 min <sup>-1</sup> . Press button T5. Injection signals stop and start again at approx. 1200 min <sup>-1</sup> .	Engine "hunts"	G 12
40	20	22		Disconnect tank vent hose. Measure CO before catalytic converter. Lambda closed-loop control - "rich" stop. Term. 24 from control unit to ground	CO rises above 3.5%. After 10 ... 20 sec CO concentration drops again to 0.2...1.2 %	G 14
41	20	23		Measure CO. Lambda closed-loop control - "lean" stop. Term. 24 from control unit to + 2 V.	CO drops below 0.2%. Engine runs rough. After 10...20 sec CO rises again to 0.2...1.2 %.	G 16
42	20	24		Measure CO. Lambda closed-loop mode. Term. 24 from control unit connected to lambda sensor. After test is completed, re-connect tank vent hose.	CO = 0.2 ... 1.2 %	G 18
43	20	24		Measure voltage at tank vent relay, if applicable, term. 31 to term. 5.	12 ... 15 V	G 20
			T6	Press button T6.	Up to 30 sec after pressing button: 0 ... 4 V After 30 sec: 12...15 V	

**A15**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



**A16**

Rapid diagnosis chart  
BMW 5, 6 and 7 series (USA, Japan)



## 2. TEST SPECIFICATIONS

### Caution:

The coordinates given on the right refer specifically to the section within a trouble-shooting program in which this test appears.

Afterward, do not continue in this trouble-shooting program, but in the "Test specifications" section or in the trouble-shooting chart.

- Idle speed: 650...750 min<sup>-1</sup>
- Exhaust-gas setting: 0.2...1.2 vol.%CO  
(Measure CO with engine at normal op. temp. and before catalytic converter. Take apart lambda sensor plug connector. Disconnect tank vent hose)

**L17**

- Fuel pressure: 2.3...2.7 bar
- Fuel pump delivery: 528e: min. 750 cm<sup>3</sup>/30s  
engine 3.2l: min. 950 cm<sup>3</sup>/30s
- Solenoid-operated injection valve  
Electrical internal resistance: 2 ... 3 Ω

**F21****K23**

- Air-flow sensor  
Resistance between term. 7 and term. 6: 8 Ω ... 1000 Ω  
(Deflect sensor flap from rest position to full-load stop)  
Term. 9 and term. 6: 500 Ω... 800 Ω

**H1****A17**

Test specifications

BMW, 5, 6 and 7 series (USA, Japan)



• Idle actuator (VDO)

Electrical internal  
resistance at +20°C: 9 ... 10  $\Omega$

**H7**

• Temperature sensor I (NTC I - Air):

Electrical internal resistance  
at +15°C...+30°C: 1.45 ... 3.3 k $\Omega$   
measured at air-flow  
sensor between term. 22  
and term. 6.

At +80°C: 280 ... 360  $\Omega$

**D9**

Temperature sensor II (NTC II - Engine):

Electrical internal resistance  
at +15°C...+30°C: 1.45...3.3 k $\Omega$   
at +80°C: 280 ... 360  $\Omega$

**D7**

• Engine-speed sensor and reference-mark  
sensor

Electrical internal  
resistance: 0.6 ... 1.6 k $\Omega$

**C22**

• Throttle-valve switch

Resistance of idle contact  
(term. 2 and term. 43): 0  $\Omega$

Full-load contact (term. 3  
and term. 43): 0  $\Omega$

• Pressure sensor (Altitude sensor)

Total resistance between  
term. 3 (+) and term. 2 (-): 2.3 ... 2.5 k $\Omega$

Resistance between wiper  
term. 1 (S) and term. 2  
(-): 0.4 ... 2.3 k $\Omega$   
(dependent on  
altitude)

**E1**

See equipment and Autodata microcards for settings  
for valve clearance and other engine data.

**A18**

Test specifications

BMW 5, 6 and 7 series (USA, Japan)



Thermo-time switch 35°C/8 sec:  
Electrical internal resistance

1. Between term. "G" and ground  
at ambient temperature  
(approx. +15°C...+30°C):  
with engine at op. temp.  
(approx. +80°C):

25 ... 40 Ω

50 ... 80 Ω

**H15**

2. Between term. "W" and ground  
at ambient temperature  
(approx. +15°C...+30°C):  
with engine at op. temp.  
(approx. +80°C):

approx. 0 Ω

100 ... 160 Ω

3. Between term. "G" and "W"  
at ambient temperature  
(approx. +15°C...+30°C):  
with engine at op. temp.  
(approx. +80°C):

25 ... 40 Ω

50 ... 80 Ω

Start valve:  
Electrical internal  
resistance

3 ... 5 Ω

**H9**

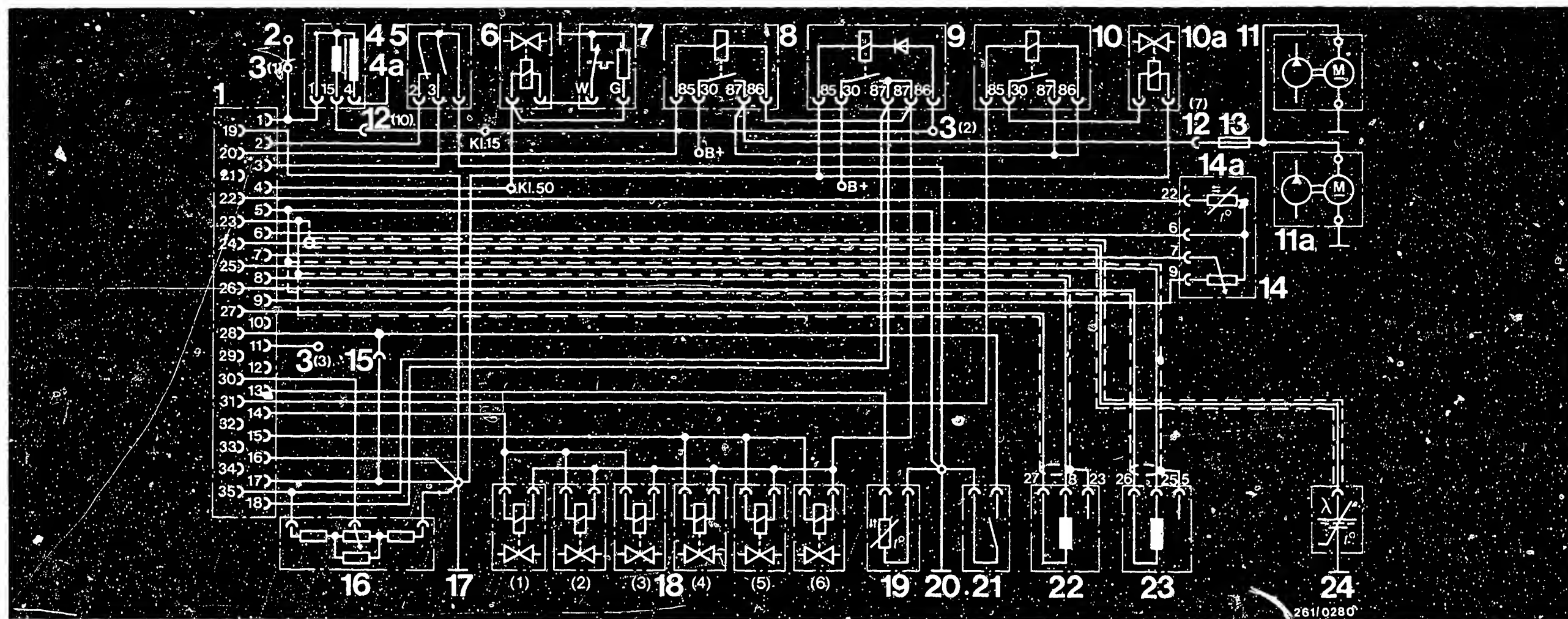
**A19**

Test specifications

BMW 5, 6 and 7 series (USA, Japan)



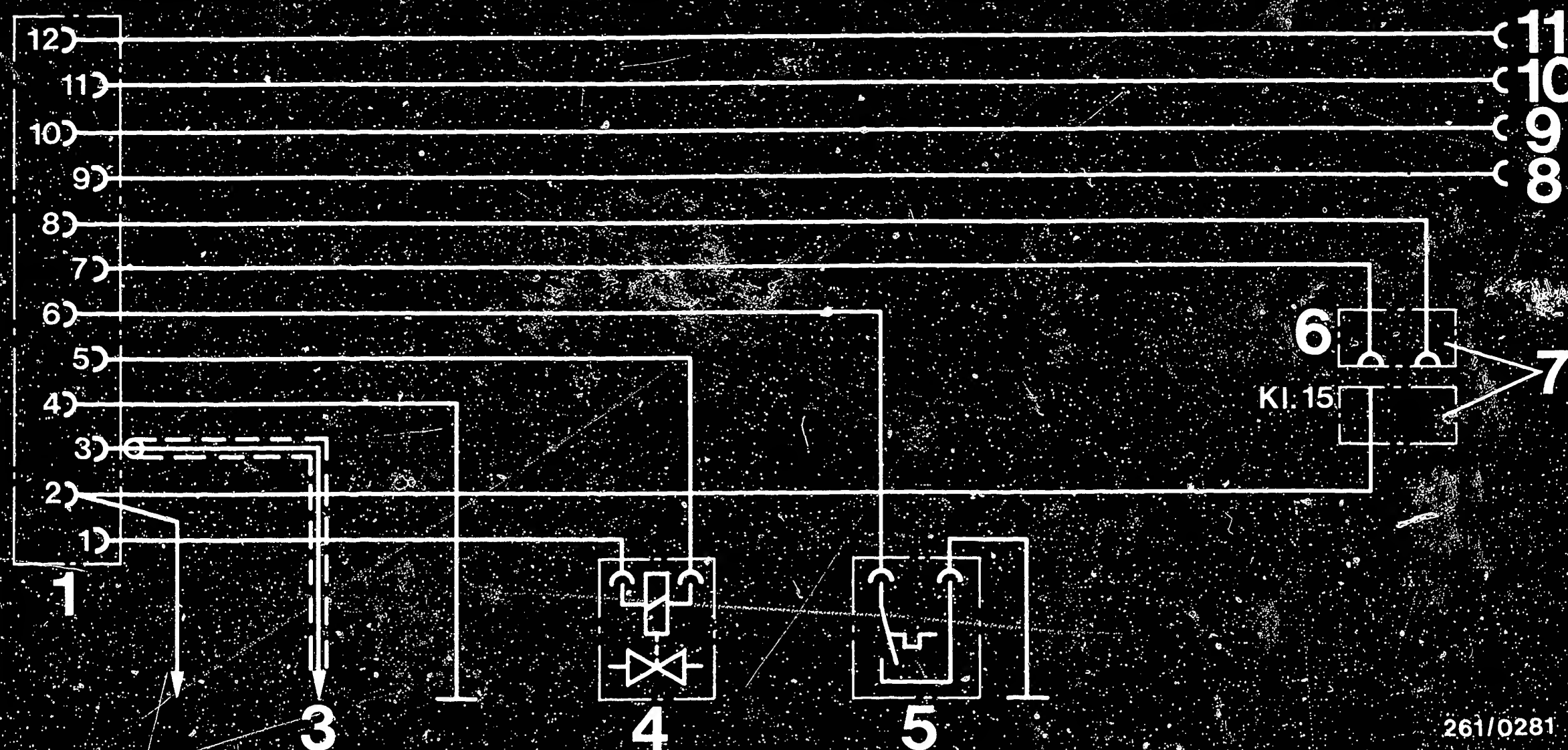




### 3. ELECTRICAL TERMINAL DIAGRAM

- |  |  |  |
|--|--|--|
| 1 = Control-unit plug  | 10 = Tank vent relay   | 17 = Vehicle ground for control unit output stage            |
| 2 = to diagnostic plug and tachometer                            | 10a = Tank vent valve  | 18 = Injection valves  |
| 3 = Plug connector (6-pin) in glove compartment                  | 11 = Fuel pump   | 19 = Coolant temperature sensor                              |
| 4 = Ignition coil  | 11a = Pre-supply pump  | 20 = Vehicle ground for control unit                         |
| 4a = to high-voltage distributor                                 | 12 = Engine plug (No.7, No.10)   | 21 = Altitude switch as of 8.83 (Item No. 15 not applicable) |
| 5 = Throttle-valve switch  | 13 = Pump fuse   | 22 = Engine-speed sensor                                     |
| 6 = Start valve  | 14 = Air-flow sensor   | 23 = Reference-mark sensor                                   |
| 7 = Thermo-time switch   | 14a = Temperature sensor I (Air)   | 24 = Lambda sensor   |
| 8 = Relay 1 (pump relay)   | 15 = Plug connector (up to 8.83) for altitude compensation                         |  |
| 9 = Relay 2 (main relay with reversed-polarity protection diode) | 16 = Altitude sensor in 528e as of 8.84 with control unit 0 261 200 021 and .. 027 |  |





### 3.1 Electrical terminal diagram for idle speed control (non-Bosch product)

1 = Control unit for idle speed control  
 3 = Engine-speed sensor  
 4 = Idle actuator  
 5 = Thermo-switch +45°C

6 = Automatic transmission connection  
 7 = connected for manual transmission  
 8 = Air conditioner  
 9 = Thermo-switch

10 = Engine temperature sensor  
 11 = Throttle-valve switch, idle contact

**A22**

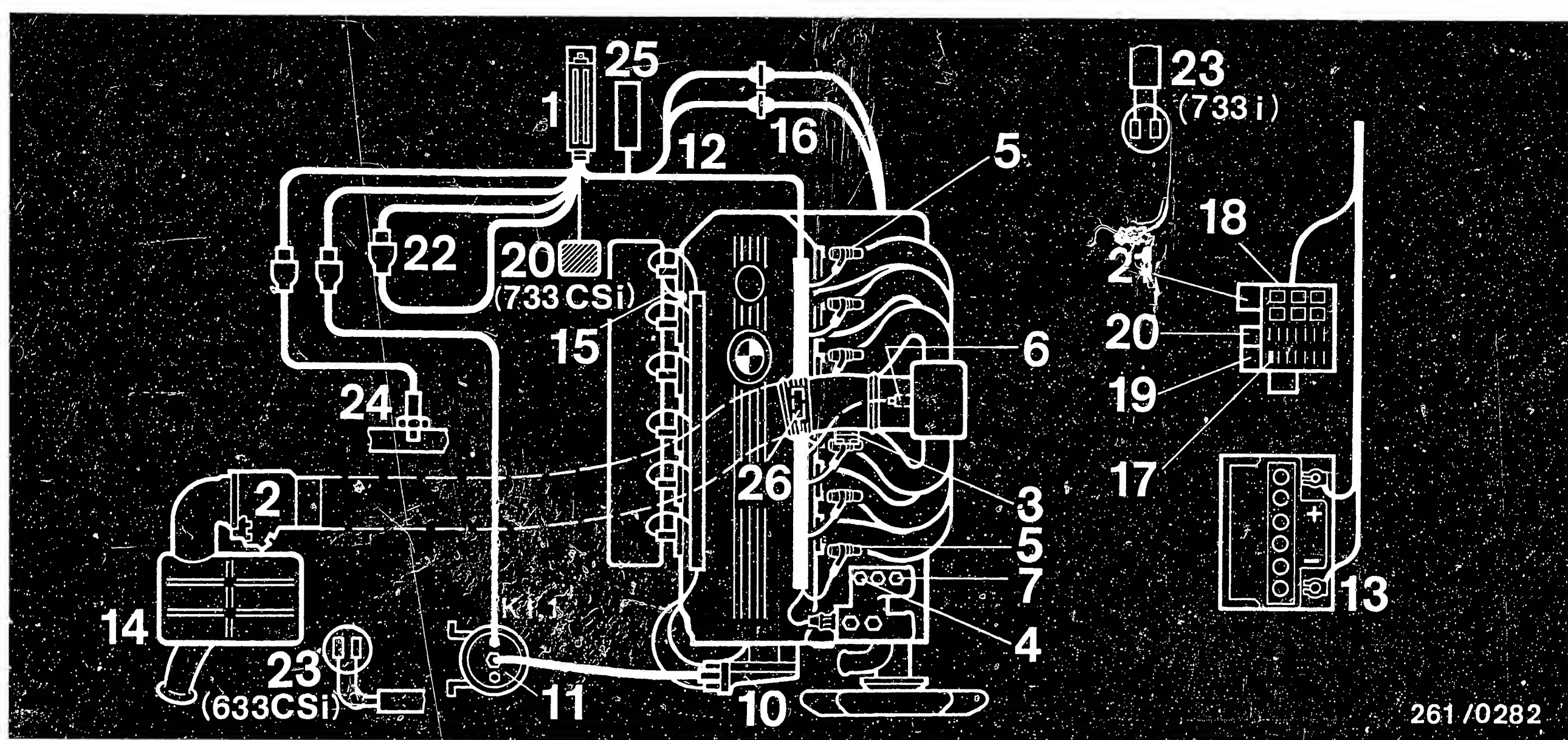
Electrical terminal diagram  
 BMW 5, 6 and 7 series (USA, Japan)



**A23**

Electrical terminal diagram  
 BMW 5, 6 and 7 series (USA, Japan)





#### 4. ELECTRICAL WIRING DIAGRAM AND ARRANGEMENT OF MOTRONIC COMPONENTS

##### 4.1 Arrangement for BMW 533i, 633CSi and 733i

- |                               |  |  |
|-------------------------------|--|--|
| 1 = Control unit              | 12 = Wiring harness  | 19 = Relay 1 for fuel pump               |
| 2 = Air-flow sensor           | 13 = Battery   | 20 = Relay 2 for control unit (733CSi)   |
| 3 = Throttle-valve switch     | 14 = Air filter  | 21 = Tank vent relay                     |
| 4 = Engine temperature sensor | 15 = Central ground  | 22 = Plug connector                      |
| 5 = Injection valves          | 16 = Plug connectors for engine-speed and reference-mark sensors | 23 = Tank vent valve                     |
| 6 = Start valve               | 17 = Pump fuse   | 24 = Lambda sensor                       |
| 7 = Thermo-time switch        | 18 = Electrics box   | 25 = Control unit for idle speed control |
| 10 = High-voltage distributor |  | 26 = Idle actuator                       |
| 11 = Ignition coil            |  |  |

**B1**

Electrical wiring diagram

BMW 5, 6 and 7 series (USA, Japan)

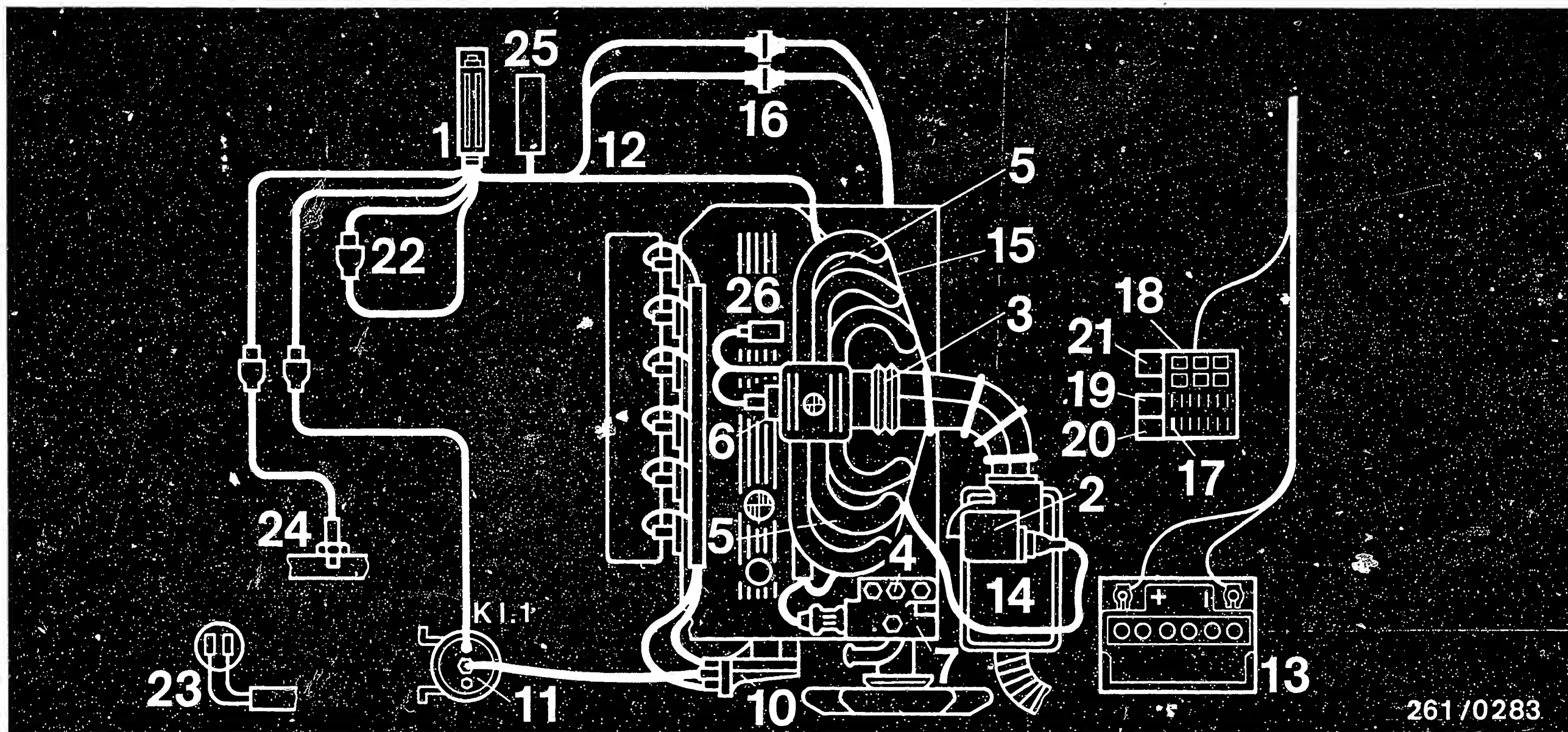


**B2**

Electrical wiring diagram

BMW 5, 6 and 7 series (USA, Japan)





#### 4.2 Arrangement for BMW 528e

- |                               |  |   |
|-------------------------------|--|---|
| 1 = Control unit              | 12 = Wiring harness  | 19 = Relay 1 for fuel pump                    |
| 2 = Air-flow sensor           | 13 = Battery   | 20 = Relay 2 for control unit                 |
| 3 = Throttle-valve switch     | 14 = Air filter  | 21 = Tank vent relay                          |
| 4 = Engine temperature sensor | 15 = Central ground  | 22 = Plug connector for altitude compensation |
| 5 = Injection valve           | 16 = Plug connectors for engine-speed and reference-mark sensors | 23 = Tank vent valve                          |
| 6 = Start valve               | 17 = Pump fuse   | 24 = Lambda sensor                            |
| 7 = Thermo-time switch        | 18 = Electrics box   | 25 = Control unit for idle speed control      |
| 10 = High-voltage distributor |  | 26 = Idle actuator                            |
| 11 = Ignition coil            |  |   |

**B3**

Electrical wiring diagram

BMW 5, 6 and 7 series (USA, Japan)



**B4**

Electrical wiring diagram

BMW 5, 6 and 7 series (USA, Japan)





## 5. INSTALLATION POSITION OF COMPONENTS

The indications "right" and "left" refer always as viewed in the forward direction of travel.

Reference-mark and engine-speed sensors:

In starting-motor ring-gear housing on circumference of flywheel ring gear.

Pressure regulator:

On fuel-distribution pipe in front of intake manifold.

Injection valves:

On intake manifold.

Start valve:

528e: On intake manifold on right.

533i, 633 CSi, 733i: On intake manifold at bottom

High-voltage distributor:

Between intake manifold and radiator fan.

Fuel filter and fuel pump:

Underneath vehicle, near fuel tank.

528e and 633CSi to right, 733i to left of differential.

Pre-supply pump:

Under mat in luggage compartment.

Air-flow sensor:

Between air filter and intake manifold.

Relay 1 (fuel pump relay):

On electrics box.  
Position varies.

Relay 2 (main relay):

On electrics box. Position varies. 733i: on firewall.

Tank vent relay:

On electrics box.  
Position varies.



Control unit:

Series 7: Behind side panel-  
ling in right-hand  
footwell

Series 5 and 6: In glove  
compartment.

Temperature sensor I:

In air-flow sensor

Temperature sensor II  
(Engine):

In front of intake manifold,  
near radiator fan.

Thermo-switch:  
(45° for idle speed  
control!):

In front of intake manifold,  
near radiator fan.

Thermo-time switch:

In front of intake manifold,  
near radiator fan.

Central ground:

528e: Below ram pipe of  
cylinder 5.

533i, 633CSi and 733i:

Underneath plug connectors for  
engine-speed and reference-  
mark sensors.

Carbon filter and  
tank vent valve:

Series 5 and 6:

Behind right-hand headlamp.

733I:

Carbon filter under battery,  
valve, near electrics box.



Control unit for  
idle speed control:

In glove compartment.

Fuel-line-pressure  
dampers:

In engine compartment; one in the fuel delivery line, a second in the fuel return line.

Lambda sensor:

In common exhaust pipe.

Plug connector for  
Lambda sensor:

In engine compartment on right, near spring strut.

Altitude sensor (pressure  
sensor) or altitude  
switch:

733i:  
on firewall on right.  
528e, 533i, 633CSi:  
On air filter.

**B7**

Installation position of components  
BMW 5, 6 and 7 series (USA, Japan)





- 1 = Idle actuator
- 2 = Start valve

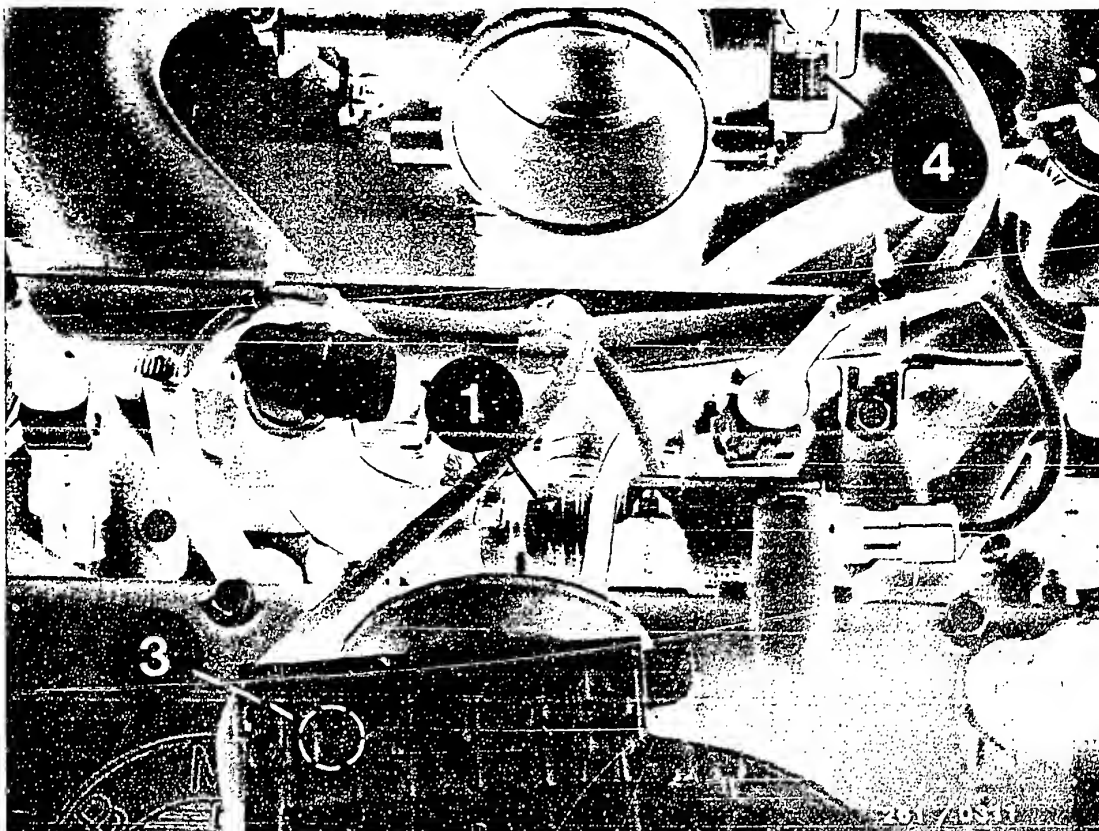
Idle actuator for idle speed control (528e)

**B8**

Installation position of components  
BMW 5, 6 and 7 series (USA, Japan)







1 = Idle actuator (non-Bosch product)  
(533i, 633CSi, 733i)

**B9**

Installation position of components  
BMW 5, 6 and 7 series (USA, Japan)



Installation position of components (continued)

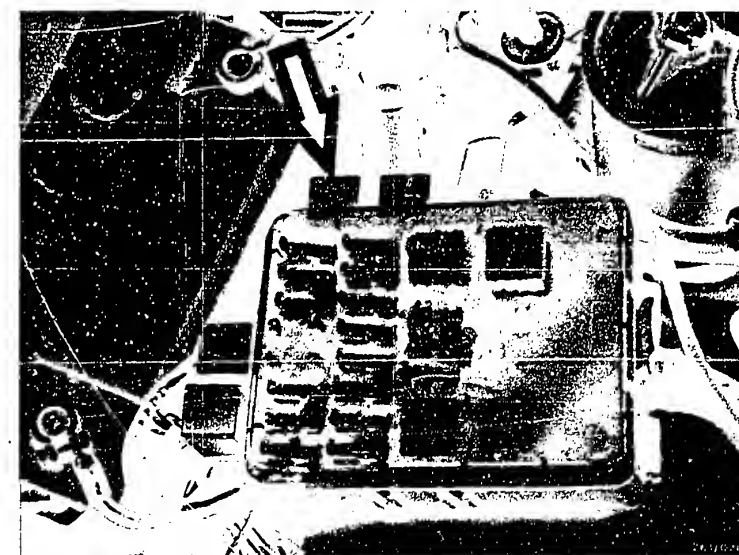
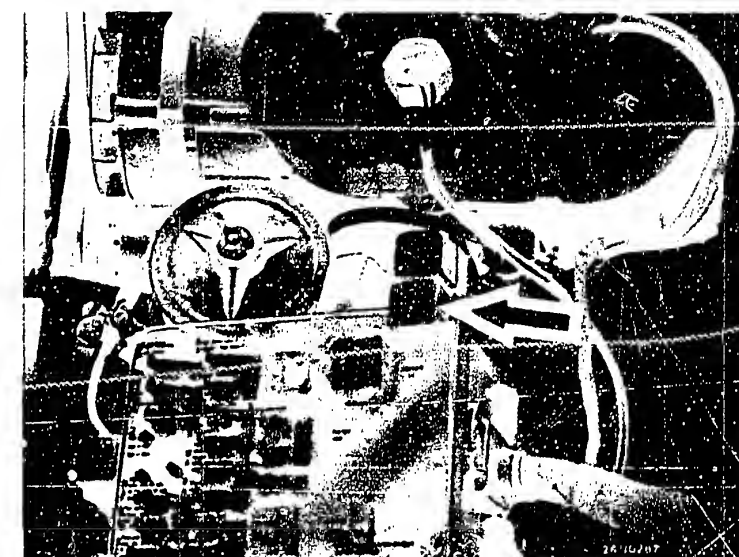
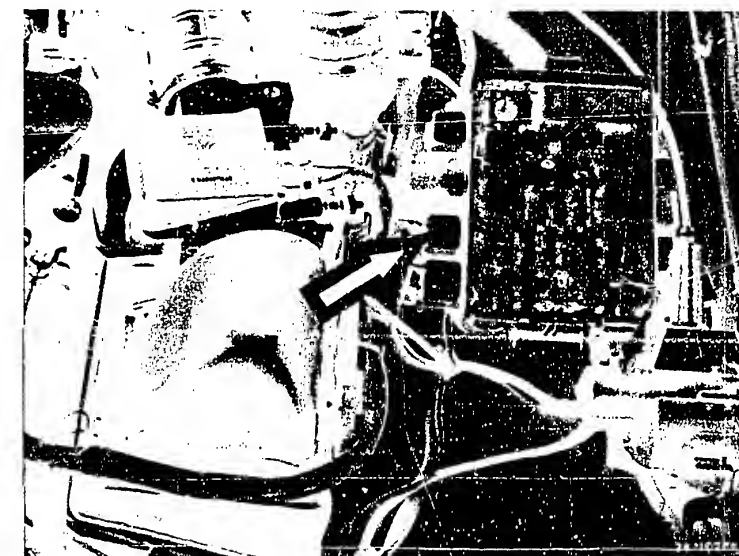
Pump relay (on electrics box-arrow)

Top picture: 528e

Center picture: 633 CSi

Bottom picture: 733i

The arrangement of the relays on the electrics box does not always correspond to the pictures shown. The reason is that the plug-in relay bases can be connected in any desired position on the electrics box.



**B 10**

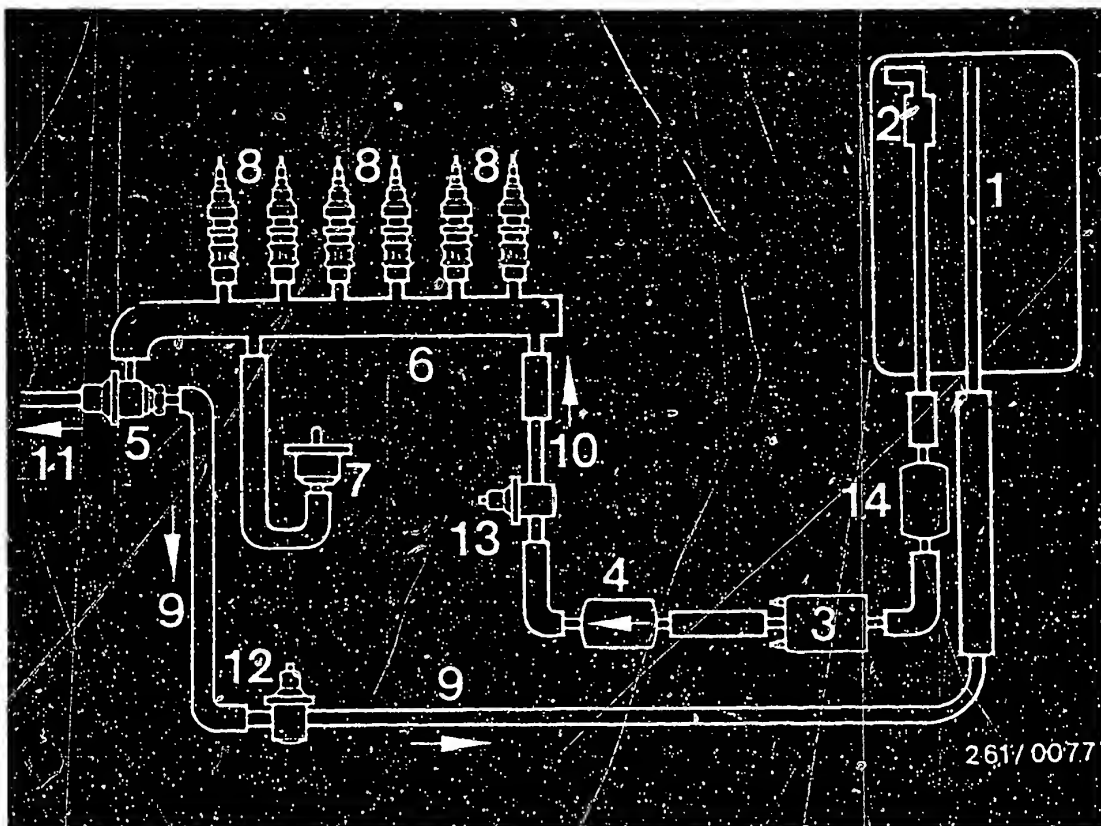
Installation position of components  
BMW 5, 6 and 7 series (USA, Japan)



**B 11**

Installation position of components  
BMW 5, 6 and 7 series (USA, Japan)





## 6. DIAGRAM OF FUEL LINES

- 1 = Fuel tank
  - 2 = Fuel pre-supply pump (in tank)
  - 3 = Electric fuel pump
  - 4 = Fuel filter
  - 5 = Pressure regulator
  - 6 = Fuel-distribution pipe
  - 7 = Start valve
  - 8 = Solenoid-operated injection valves
  - 9 = Fuel return line
  - 10 = Fuel delivery line
- Fuel delivery and return lines are routed on the left-hand underside of the vehicle.
- 11 = to intake manifold
  - 12 = 1st fuel-line-pressure damper
  - 13 = 2nd fuel-line-pressure damper
  - 14 = Fuel spinner (in 733i only)



## 7. TEST EQUIPMENT AND TOOLS

Description	Designation	Part No.
Universal test adapter Adapter lead USA/Japan	ETT 018.01	0 684 101 801 1 684 463 128
Motortester	e.g. MOT 201	0 684 000 201
Diagnostic cable for spark-advance measure- ment		1 684 463 095
Exhaust-gas analyzer	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Multimeter (internal resistance min. 20 k $\Omega$ /V)		commercially available e.g. Metra- watt GmbH type MA 2 H or Fluke Multime- ter 75 or 77
Pressure gauge 6 bar  or pressure tester or pressure tester (no longer avail- able)  Three-way line as connecting part for KDJE-P 100 and KDEP 1034	Quality class 1.0 0.1 bar gradua- tion	1 687 231 154  KDJE-P 100  KDEP 1034  KDJE-P 100/13



## Description

## Part No.

Feeler gauge for measuring sensor air gaps (up to 1 mm)	commercially available
Lubricant for engine-speed and reference- mark sensors	Molykote Longterm 2 commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Test lead 2-pin, for measuring resistances and signals e.g. at injection valves	1 684 463 093
Test leads for correct connection of testers to components plugs	KDZS 0004 (2.8 mm wide) KDZS 0005 (6.3 mm wide)

For USA/Japan:

Tool set for removing and fitting idle CO anti-tamper  
device on air-flow sensor, e.g. No. 13 1090 from

Cartool

Hans Schubert KG

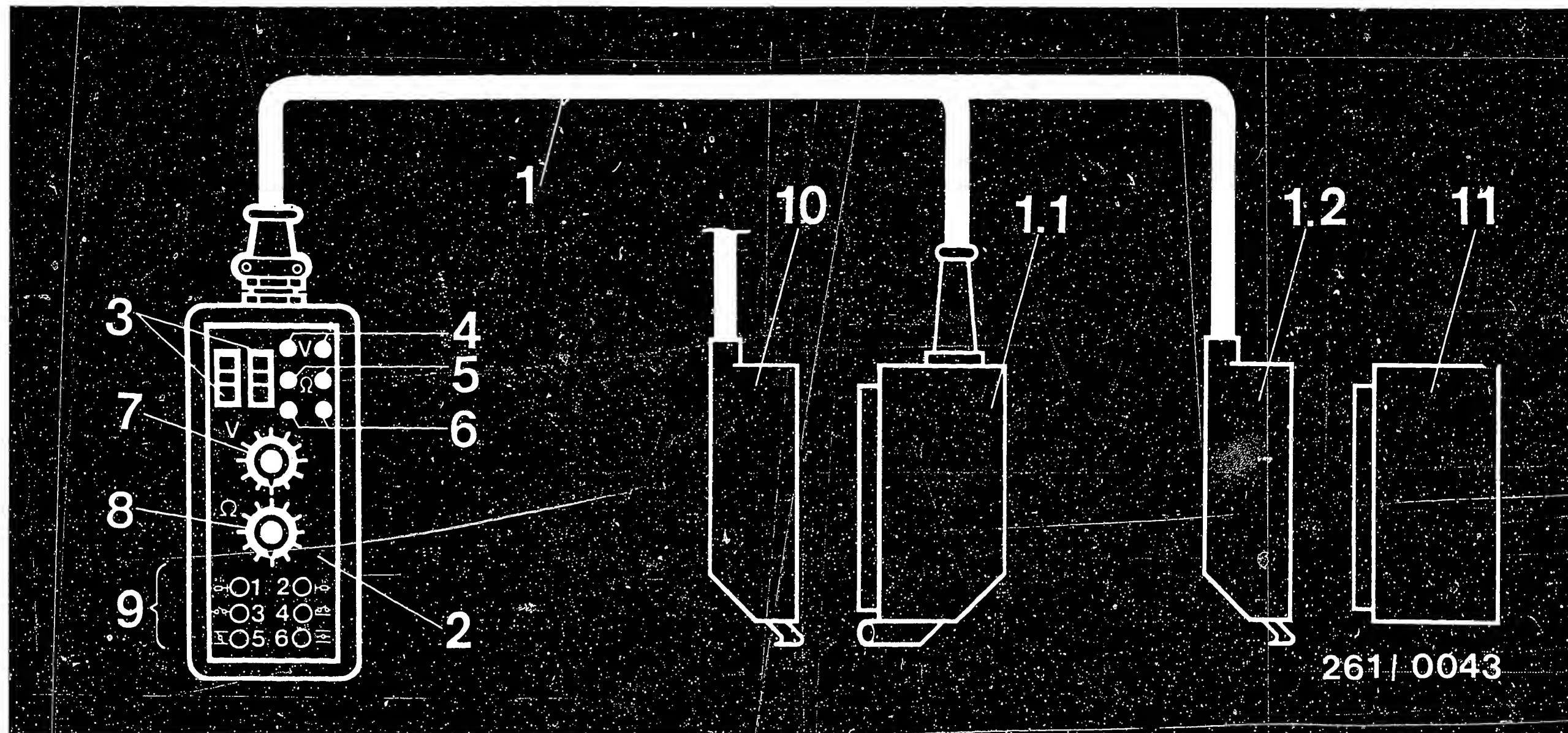
Unterer Grasweg 88

D-8070 Ingolstadt

or from BMW of America

Mounting paste VS 14016 Ft for lambda sensor and exhaust screw plug Hose clamper for pinching off fuel and air hoses.	5 964 080 105
---	---------------





# Universal test adapter with adapter lead for Motronic

- 1 = Adapter lead
- 1.1 = Connection to wiring harness
- 1.2 = Connection to control unit
- 2. = Universal test adapter (Part No.: 0 684 101 801)
- 3 = Test well (for motortester)
- 4 = Test sockets (for voltage measurement)
- 5 = Test sockets (for resistance measurement)
- 6 = Test sockets (not assigned)
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Button panel for simulation of operating conditions
- Button 1 = NTC II (engine), cold (-20°C)
- Button 2 = NTC II (engine), warm (+80°C)
- Button 3 = Pump energization
- Button 4 = not occupied
- Button 5 = Throttle-valve idle contact
- Button 6 = Throttle-valve full-load contact
- 10 = Motronic wiring harness
- 11 = Control unit

**B15**

Test equipment and tools

BMW 5, 6 and 7 series (USA, Japan)



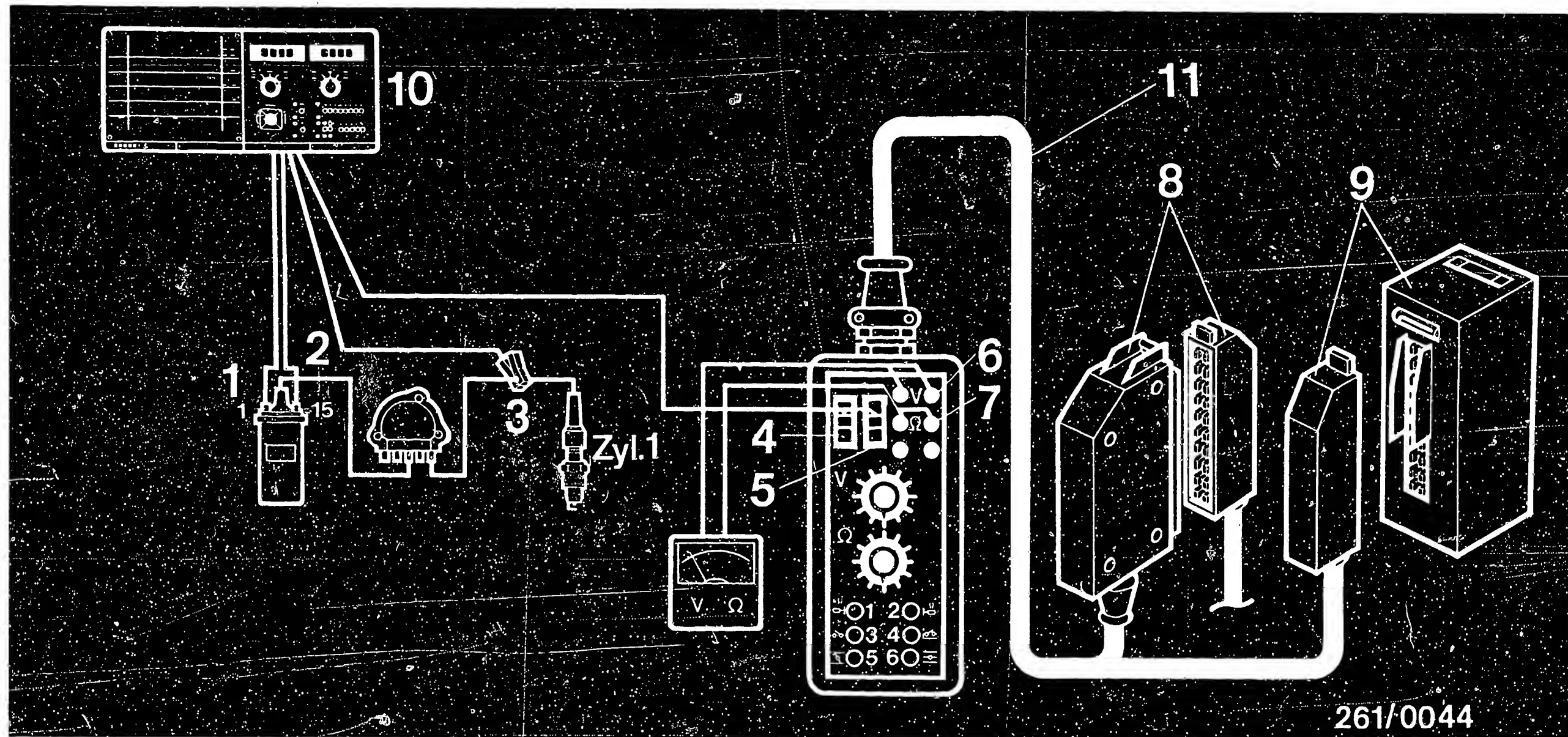
**B16**

Test equipment and tools

BMW 5, 6 and 7 series (USA, Japan)







Connection diagram for universal test adapter

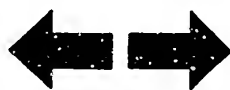
- 1 = Green clip to ignition coil term. 1
- 2 = Yellow clip to ignition coil term. 15
- 3 = Induction-type clamp-on pickup over ignition cable of cylinder 1
- 4 = Red connection socket (test well) for red clamp of motortester
- 5 = Black connection socket (test well) for black clamp of motortester

- 6 = Connection of voltmeter at V-sockets (red = +, black = ground/negative)
- 7 = Connection of ohmmeter at Ω-sockets (blue)
- 8 = Connection to Motronic wiring harness
- 9 = Connection to Motronic control unit
- 10 = Motortester
- 11 = Adapter lead for Motronic with lambda-closed loop control

**B17**

Test equipment and tools

BMW 5, 6 and 7 series (USA, Japan)



**B18**

Test equipment and tools

BMW 5, 6 and 7 series (USA, Japan)



## 8. IMPORTANT GENERAL INFORMATION

Be sure to follow these instructions in order to prevent damage to the engine, the control unit or the ignition coil, as well as to prevent danger to persons.

- Never start engine without securely connected battery.
- Incorrect polarity of supply voltage, e.g. through incorrect connection of battery or ignition coil, can lead to destruction of control unit.
- Do not use a fast charger for starting the engine.  
Starting assistance only with second 12 V battery and jump leads.

### Caution:

Because of non-standardized requirements of vehicle manufacturers for electronic products, we recommend not using a 24 V battery for starting assistance. Follow vehicle owner manual.

- Disconnect the battery from the vehicle electrical system before fast charging.
- If charging the battery in the vehicle or if rendering starting assistance, follow the instructions in the operating instructions of the fast charger as well as the instructions of the vehicle manufacturer.
- Never disconnect the battery from the vehicle electrical system with the engine running.
- Do not short-circuit ignition coil term. 1 to ground (e.g. for stopping the engine). Ignition coil and possibly control unit will be destroyed.





- Never connect the positive pole of the battery to ignition coil term. 1. Control unit will be destroyed.
- Never connect or disconnect wiring-harness plug of control unit with ignition on.
- At temperatures above +80°C (paint-drying installation) remove the control unit.
- Remove the control unit before performing welding work (electrical spot welding).
- When testing compression, disconnect the relay set. This prevents undesired injecting through the injection valves.
- If an alarm system is installed, observe the information in the installation instructions for Motronic vehicles or after-sales service instructions SIS-All-500.
- It must be guaranteed that the alarm relay is not disturbed by extraneous sources (e.g. by ignition cables), thus causing the alarm relay to trip incorrectly.

### C A U T I O N !

High-energy ignition system,  
dangerous voltages on primary  
and secondary sides.



This means the following:

The Motronic contains a high-energy ignition system which can be extremely dangerous if live parts or terminals are touched (both on the primary as well as on the secondary side).

In this connection, we should like to point out that, when working on or testing the ignition system, you should observe the VDE regulations, particularly VDE 0104/7.67.

Always switch off the ignition (switch off ignition/voltage source) when working on the ignition coil.

Such work includes:

Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).

Replacing of parts of the ignition system (spark plug, ignition coil, high-voltage distributor, ignition cable etc.).

If, when testing the ignition system or performing adjustment operations on the engine, it becomes necessary to switch on the ignition (switch on ignition/voltage source), the aforementioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual components of the ignition system (such as high-voltage distributor, ignition coil, control unit and ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and on test equipment.



## 9. TROUBLE-SHOOTING

Using the universal test adapter and other suitable testers, the following trouble-shooting programs are intended to enable the workshop employees to quickly detect causes of trouble on the Motronic.

Depending on the level of training and experience of the workshop employee, a choice can be made between the following working procedures.

- detailed, step-by-step trouble-shooting: for employees with little practice or experience on Motronic vehicles
- pin-pointed, direct trouble-shooting: for experienced employees with a great deal of practice on Motronic vehicles.

**C3**

**C5**

Both trouble-shooting programs begin by checking the electrical/electronic part of the Motronic with the aid of the universal test adapter ETT 018.01. With this, the wiring harness with the components connected to it (including control unit) are quickly checked for proper electrical operation and faults are rapidly detected.

If no fault is found with the universal test adapter, it is necessary to continue with the detailed or direct trouble-shooting program.

**C1**

Troubel-shooting

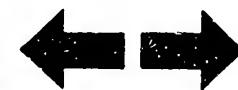
BMW, 5, 6 and 7 series (USA, Japan)



**C2**

Trouble-shooting

BMW, 5, 6 and 7 series (USA, Japan)



## 9.1 Detailed, step-by-step trouble-shooting

### 9.1.1 Test with universal test adapter

This test must come at the beginning of the testing program and must be performed from beginning to end.

### 9.1.2 Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the column on the right gives the first coordinate of the respective detailed trouble-shooting program.

The trouble-shooting program consists of logically ordered test procedures for all Motronic components.

If, after completing the trouble-shooting program for an assumed symptom, the fault has not been detected or remedied, choose a new fault symptom and work through another program.

<u>Customer complaints (fault symptoms)</u>	<u>Test with universal test adapter</u>	<u>Coordinates</u>
1. Starting motor operates, engine fails to start or starts only with difficulty	C 11	G 23
2. Engine starts but then dies	C 11	H 21
3. Rough idle/incorrect idle speed	C 11	J 9
4. Poor throttle take-up	C 11	K 1
5. Engine missing under all operating conditions	C 11	K 17
6. Fuel consumption too high	C 11	L 7
7. Maximum engine power/top speed not reached	C 11	L 19
8. CO concentration at idle too high or too low	C 11	M 13

**C3**

Trouble-shooting  
BMW, 5, 6 and 7 series (USA, Japan)

**C4**

Trouble-shooting  
BMW, 5, 6 and 7 series (USA, Japan)



## 9.2 Pin-pointed, direct trouble-shooting

### 9.2.1 Test with universal test adapter

The test with the universal test adapter must come at the beginning of the testing program and must be performed from beginning to end.

### 9.2.2 Trouble-shooting according to customer complaints

The table below contains various fault symptoms with several possible causes of the trouble in each case. The coordinate reference panel indicates the first coordinate of the testing procedure for the respective Motronic component.

If, after testing the individual components, the fault has not been detected or remedied, choose a new fault symptom.

#### Customer complaints (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty
  2. Engine starts but then dies
  3. Rough idle/incorrect idle speed
  4. Poor throttle take-up
  5. Engine missing under all operating conditions
  6. Fuel consumption too high
  7. Maximum engine power/top speed not reached
  8. CO concentration at idle too high or too low
- Cause (component fault)

C11	C11	C11	C11	C11	C11	C11	C11	Test with universal test adapter
●*)								Main or pump relay defective
●*)								Electric fuel pump not operating
H 7	J 1	J15	K15					Idle speed control defective
		●*)				●*)		Throttle-valve switch (idle and full-load contacts) defective
H17	J 7	J11	K 7	K21	L13	L23	M15	Air-flow sensor defective

Continued on C7/C8, C9/C10

**C5**

Trouble-shooting

BMW 5, 6 and 7 series (USA, Japan)



**C6**

Trouble-shooting

BMW 5, 6 and 7 series (USA, Japan)



# Customer complaints (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty
  2. Engine starts but then dies
  3. Rough idle/incorrect idle speed
  4. Poor throttle take-up
  5. Engine missing under all operating conditions
  6. Fuel consumption too high
  7. Maximum engine power/top speed not reached
  8. CO concentration at idle too high or too low
- Cause (component fault)

H17	H23	J13	K9			M11	M19	Air-intake system leaking
H9		J19			L13	L23		Solenoid-operated injection valves defective
●*)		●*)				M7		Fuel pressure too low or zero, pressure regulator not operating
		●*)			●*)		●*)	Fuel pressure too high, pressure regulator not operating
				K23		M5		Insufficient fuel delivery
	●*)				●*)		●*)	Temperature sensor I (air) or temperature sensor II (coolant) defective
						L21		Throttle valve not opening fully
				K19				Poor central ground, loose contacts, faulty plug-in connection
H17	H23	J13	K9			M11	M19	Open circuit in wiring harness and plug-in connections
H9								Start valve not opening
	J3	J17			L11		M17	Start valve not closing
H15	J5							Thermo-time switch defective
		J23			L17		M21	CO exhaust-gas setting too rich
		J23	●*)				M21	CO exhaust-gas setting too lean
		●*)	●*)		●*)		●*)	Altitude sensor defective

Continued on C9/C10

**C7**

Trouble-shooting

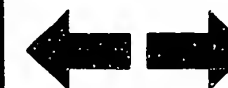
BMW 5, 6 and 7 series (USA, Japan)



**C8**

Trouble-shooting

BMW 5, 6 and 7 series (USA, Japan)



# Customer complaints (fault symptoms)

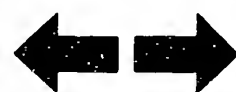
1. Starting motor operates, engine fails to start or starts only with difficulty								
2. Engine starts but then dies								
3. Rough idle/incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. Maximum engine power/top speed not reached								
8. CO concentration at idle too high or too low								
<u>Cause</u> (component fault)								

●*)								Engine-speed sensor defective
●*)								Reference-mark sensor defective
				L 5				Check alternator, interference-suppression devices
H 1		J11	K 3	K19	L 9	L21	M15	Check secondary patterns
●*)	●*)	●*)	●*)	●*)	●*)	●*)	●*)	Control unit defective
		●*)					●*)	Lambda closed-loop control defective

●\*) This component has already been tested if you have already performed the test with the universal test adapter. Continue testing with the next component in this column.  
 If, however, you have arrived at this point by way of a component complaint or the test-specifications table, you must now test this component with the universal test adapter.  
 The testing program for the universal test adapter starts on Coordinate C11 and must be performed from beginning to end.

**C9**

Trouble-shooting  
 BMW 5, 6 and 7 series (USA, Japan)



**C10**

Trouble-shooting  
 BMW 5, 6 and 7 series (USA, Japan)



## 10. TEST WITH UNIVERSAL TEST ADAPTER

ETT 018.01 (0 684 101 801) and adapter lead for Motronic with lambda closed-loop control (1 684 463 128)

Connect universal test adapter to Motronic wiring harness (ignition must be off).

To test the wiring harness and the components connected to it, only the Motronic wiring harness may be connected, but not the control unit. Be sure to follow the instructions in the test chart.

To take the measurements, connect a measuring instrument for voltage and resistance (multimeter) as well as the motortester to the test adapter.

The individual test steps are selected with the program switch. The symbols "V" and " $\Omega$ " show the operator whether voltage or resistance is being measured. Some switch settings are also required for simulation with the engine running. By pressing the buttons, it is possible with the control unit connected and the engine running to simulate operating conditions. Thus, for example, with the engine at normal operating temperature, it is possible by pressing button T1 to make the control unit think that the engine temperature is  $-20^{\circ}\text{C}$ . The reaction of the control unit can then be evaluated on the motortester.

If necessary, the circuit diagram can be used for trouble-shooting.





## Preparations for testing with the universal test adapter

### 1. Remove control unit and connect test adapter

Installation position of control unit in model series 5 and 6:  
Glove compartment behind the cover.

In 733i: Behind the side panelling on the right-hand side in the front-passenger footwell.

To remove the control unit, press the detent to the rear and hinge up the plug and unhook it.

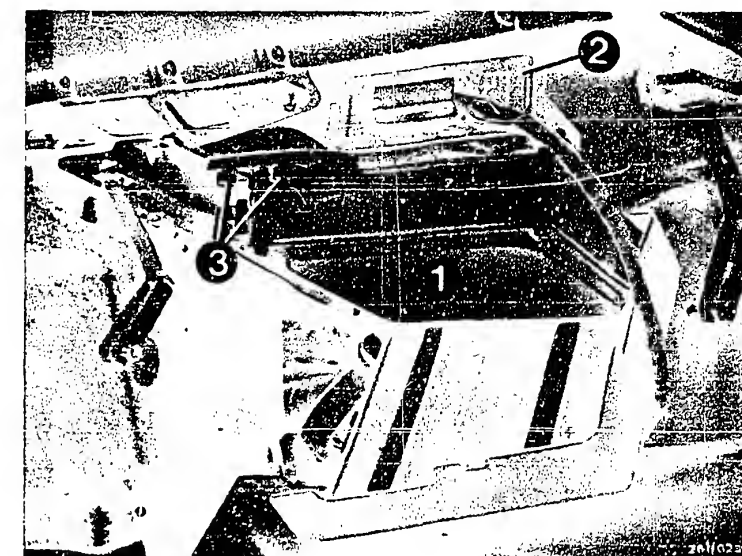
The control unit is fastened by 4 screws.

#### Note:

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control have mating recesses and pins.

#### Note:

In the following test steps a white border in the "Operation" column indicates which operation has to be changed as compared to the preceding test step.

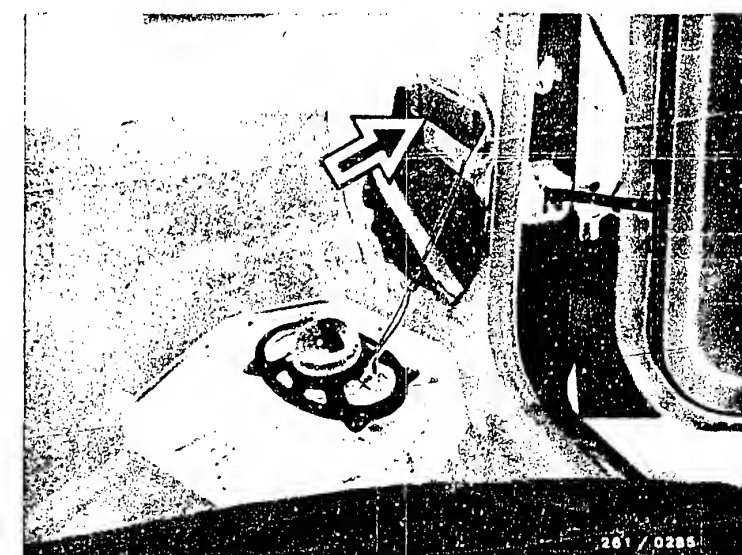


#### 528e, 633CSi:

1=Control unit for Motronic  
2=Control unit for idle speed control  
3=Fastening screws

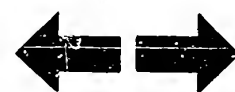
#### 733i:

Arrow=Control unit for Motronic



**C12**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

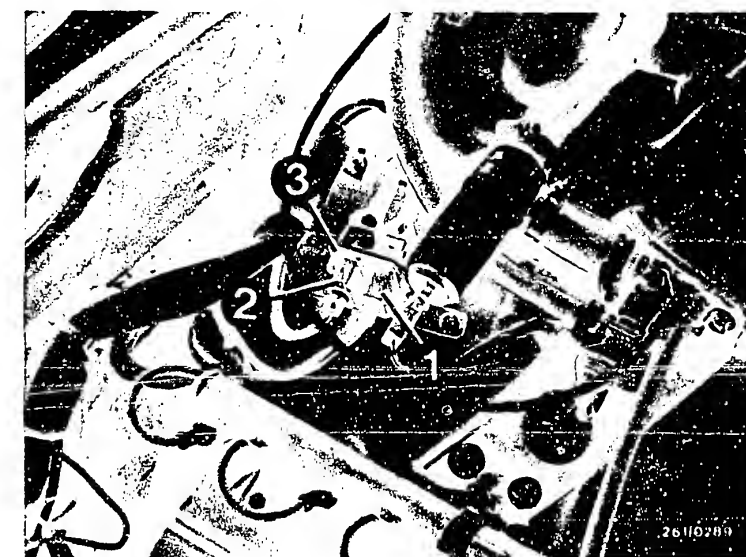


**C13**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 1: Switch off ignition. Disconnect control unit Motronic and idle speed control as well as pump relay.			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch position "V"</u>	↓	Ohmmeter must indicate  <u>greater than 1 MΩ</u>	<u>Component:</u> Engine-speed sensor
<u>Program switch position "Ω"</u>	1		
<u>Measuring equipment:</u> Ohmmeter		<div>yes</div> <div>no</div>	<u>Operation:</u> Insulation from term. 8 to ground
<u>Measuring range:</u> 10 MΩ			
<u>Connection:</u> Test sockets	Ω		
<u>Operation in vehicle:</u> Switch off ignition		Continue testing with <u>next test step</u>	<u>Malfunction:</u> Resistance less than 1 MΩ



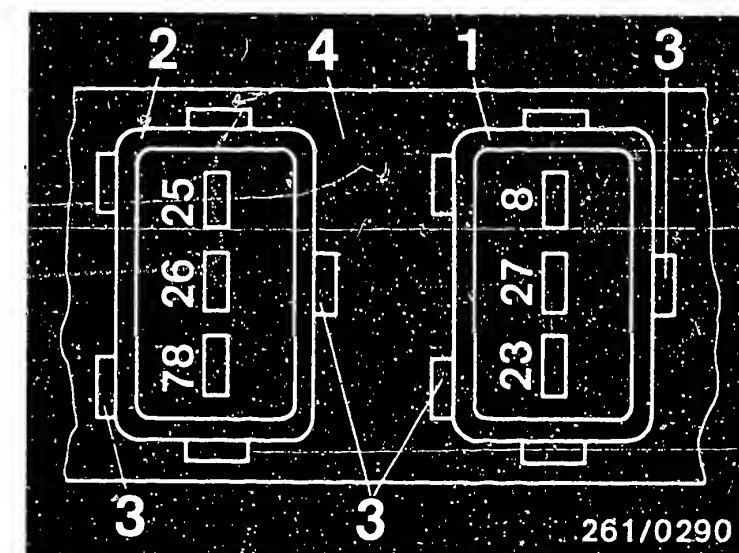
528e

- 1=Plug connector of engine-speed sensor
- 2=Plug connector of reference-mark sensor (marked)
- 3=Holding plate
- 1=Engine-speed sensor connector
- 2=Reference-mark sensor connector (marked)
- 3=Locating lugs
- 4=Holding plate

### Trouble-shooting:

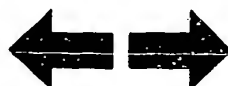
Check plug-in connection for corrosion and insulation damage. Take apart plug-in connection and, using a wire, jump terminals 8 and 27 on the plug leading to the test adapter. Repeat test: If reading now O.K., replace engine-speed sensor. If reading still below test specification, there is insulation damage on the leads from control-unit plug term. 8 or term. 27 to the plug (e.g. short circuit to ground due to worn spot).

Continued on C16/C17



**C14**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**C15**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



## Trouble-shooting - TEST STEP 1 (continued)

### ● Replacing the sensor.

To replace the sensor, unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits from the sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.

Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

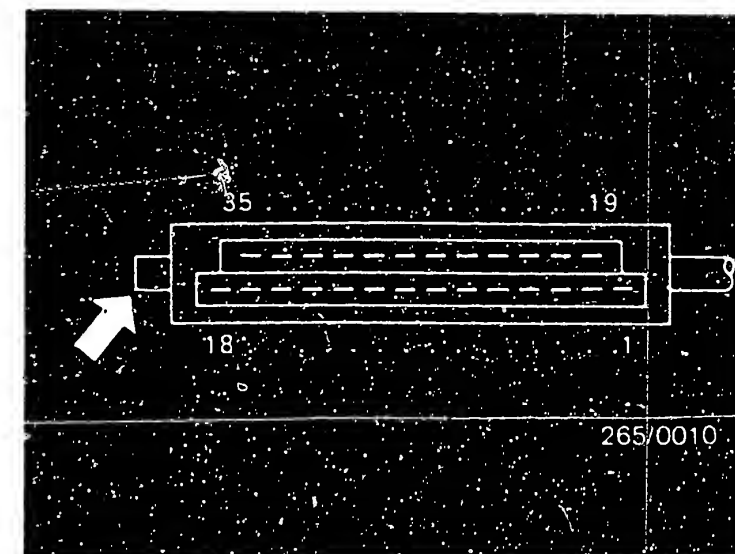
### Pay attention to markings:

The reference-mark sensor is marked by a cable binder.

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.

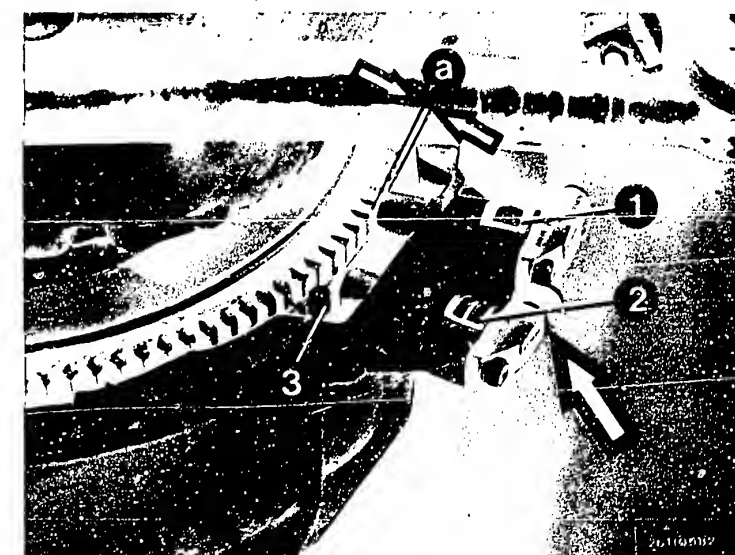
When mounting, make sure that the plug connectors are correctly assigned.

Pay attention to the correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

1=Engine-speed sensor (D)  
2=Reference-mark sensor (B)  
3=Reference mark  
a=Air gap  
Arrow=Marking for reference-mark sensor



**C16**




Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

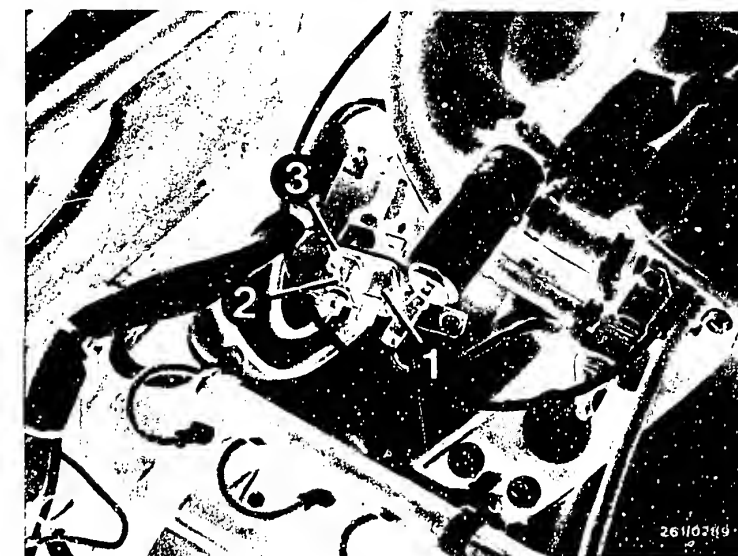


**C17**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

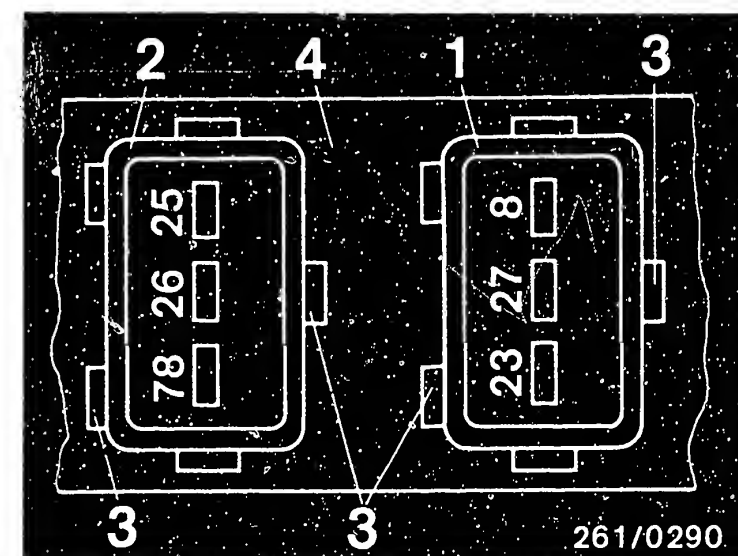


TEST STEP 2			
Operation		Reading	Testing
Program switch position "V"		Ohmmeter must indicate <u>greater than 1 M <math>\Omega</math>.</u>	<u>Component:</u> Reference-mark sensor
Program switch position "Ω"	2		
<u>Measuring equipment:</u> Ohmmeter		yes 	<u>Operation:</u> Insulation from term. 25 to ground
<u>Measuring range:</u> 10 M $\Omega$			
<u>Connection:</u> Test sockets $\Omega$		no 	<u>Malfunction:</u> Resistance less than 1 M $\Omega$
<u>Operation in vehicle:</u> Switch off ignition			
		Continue testing with next test step	



528e

- 1=Plug connector of engine-speed sensor  
 2=Plug connector of reference-mark sensor (marked)  
 3=Holding plate  
 1=Engine-speed sensor connector  
 2=Reference-mark sensor connector (marked)  
 3=Locating lugs  
 4=Holding plate



### Trouble-shooting:

Check plug-in connection for corrosion and insulation damage.  
 Take apart plug-in connection and, using a wire, jump terminals 25 and 26 on the plug leading to the test adapter.  
 Repeat test: If reading now O.K., replace engine-speed sensor. If reading still below test specification, there is insulation damage on the leads from control-unit plug term. 25 or term. 26 to the plug (e.g. short circuit to ground due to worn spot).

Continued on C20/21

**C18**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



**C19**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



## Trouble-shooting - TEST STEP 2 (continued)

### ● Replacing the sensor.

To replace the sensor, unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits from the sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.

Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

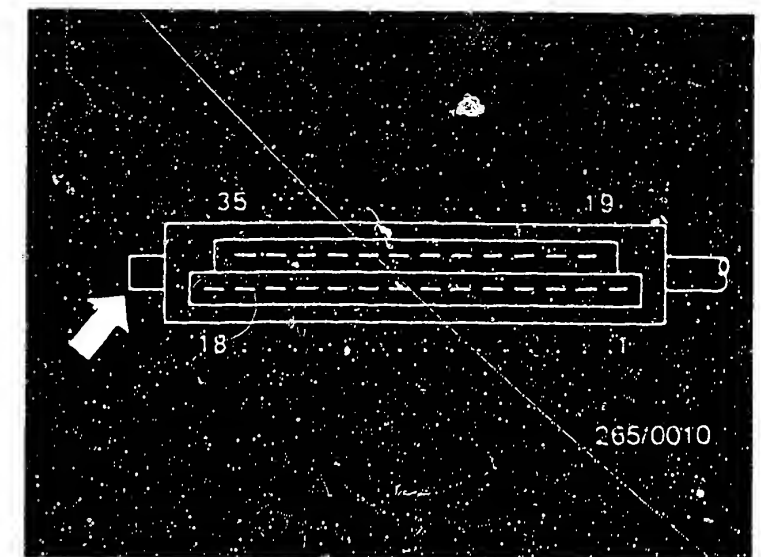
### Pay attention to markings:

The reference-mark sensor is marked by a cable binder.

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.

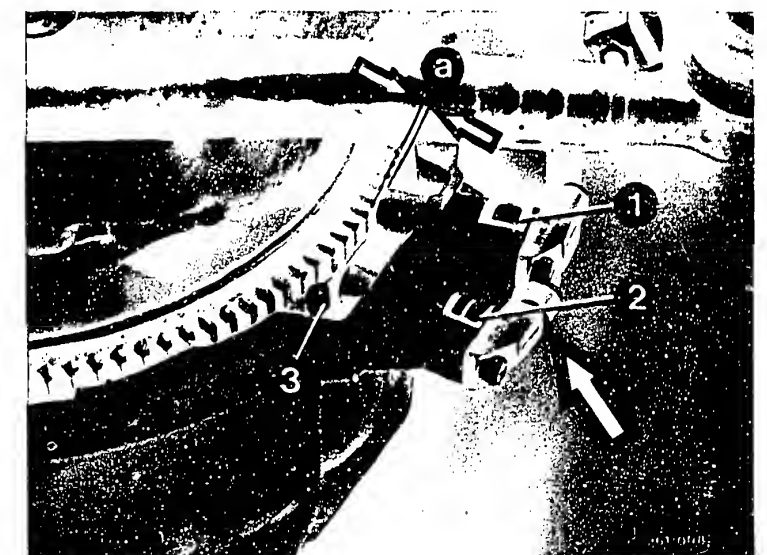
When mounting, make sure that the plug connectors are correctly assigned.

Pay attention to the correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

1=Engine-speed sensor (D)  
2=Reference-mark sensor (B)  
3=Reference mark  
a=Air gap  
Arrow=Marking for reference-mark sensor



**C20**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**C21**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





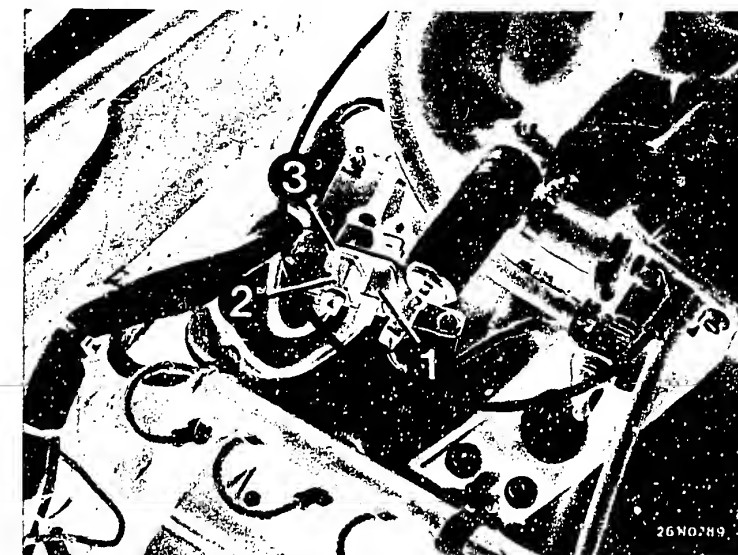
TEST STEP 3				
Operation		Reading	Testing	
Program switch position "V"	↓	Ohmmeter must indicate	Component:	
		0.6 ... 1.6 kΩ	Engine-speed sensor	
Program switch position "Ω"	3	yes	no	Operation:
Measuring equipment: Ohmmeter		↓		Winding resistance between term. 8 and term. 27
Measuring range:		Continue testing with next test step		
0 to 10 kΩ				
Connection:				Malfunction:
Test sockets	Ω			Resistance not within tolerance
Operation in vehicle:				
Switch off ignition				

#### Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection: Corrosion, loose contact, (spring contacts must not allow themselves to be pushed back).
- Check leads from engine-speed sensor term. 8 and term. 27 to control-unit plug term. 8 and term. 27.
- Replace the sensor.

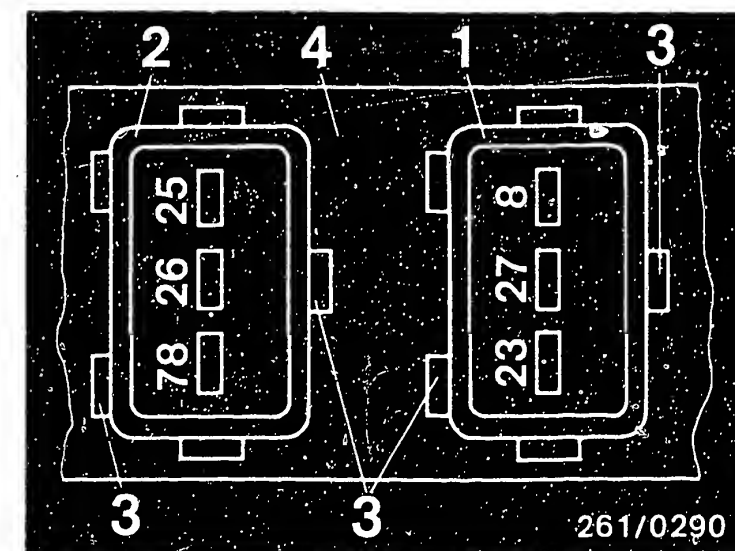
To replace the sensor, take apart the plug-in connection and unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits from sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.  
Caution: Do not loosen the holder.

Continued on D1/D2



528e

- 1=Plug connector of engine-speed sensor
- 2=Plug connector of reference-mark sensor (marked)
- 3=Holding plate
- 1=Engine-speed sensor connector
- 2=Reference-mark sensor connector (marked)
- 3=Locating lugs
- 4=Holding plate



**C22**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**C23**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



### Trouble-shooting - TEST STEP 3 (continued)

Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

#### Pay attention to markings:

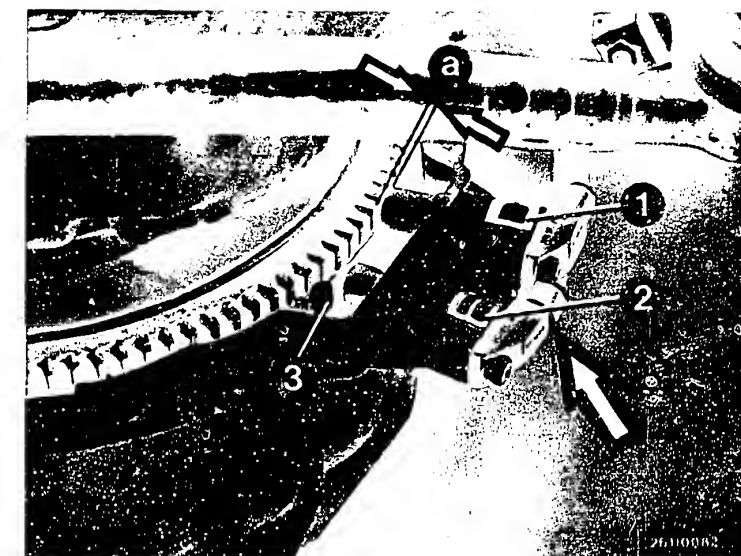
The reference-mark sensor is marked by a cable binder.

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.

When mounting, make sure that the plug connectors are correctly assigned.

Pay attention to the correct seating and latching of the spring contacts in the plug.

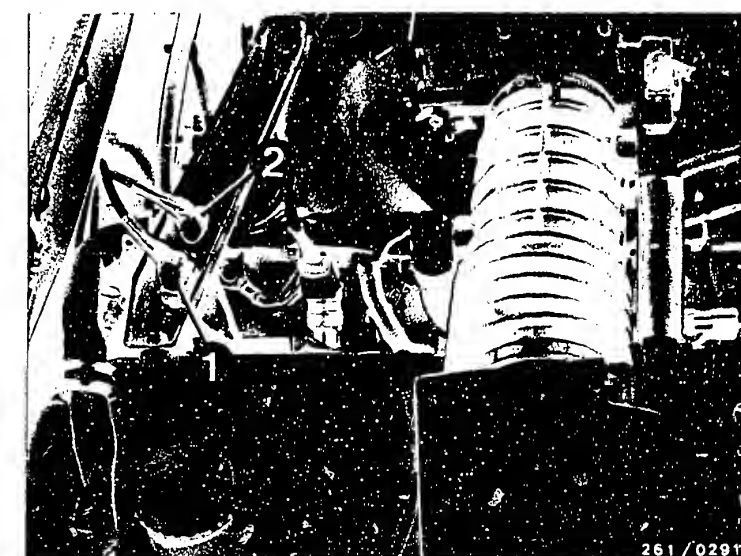
Spring contacts must not allow themselves to be pushed back.



1=Engine-speed sensor (D)  
2=Reference-mark sensor (B)  
(Arrow=Marking)  
3=Reference mark  
a=Air gap

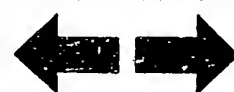
5338,633CSi,733i:

1=Plug connector of engine-speed sensor  
2=Plug connector of reference-mark sensor (marked)



**D1**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



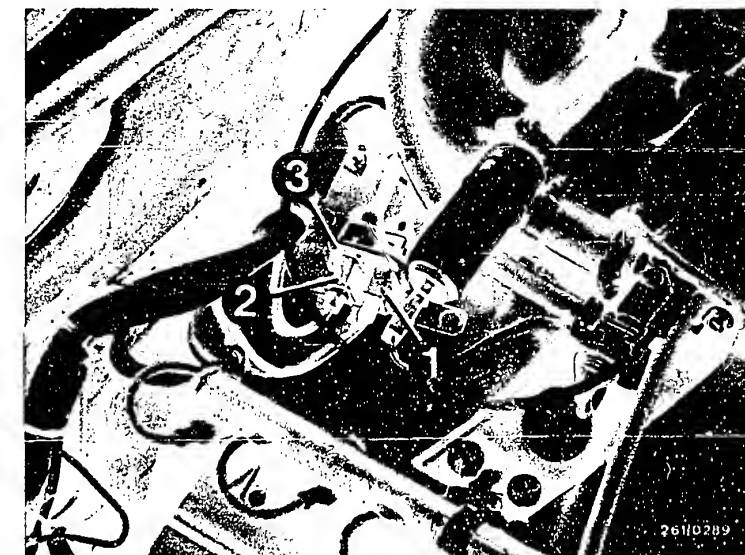
**D2**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



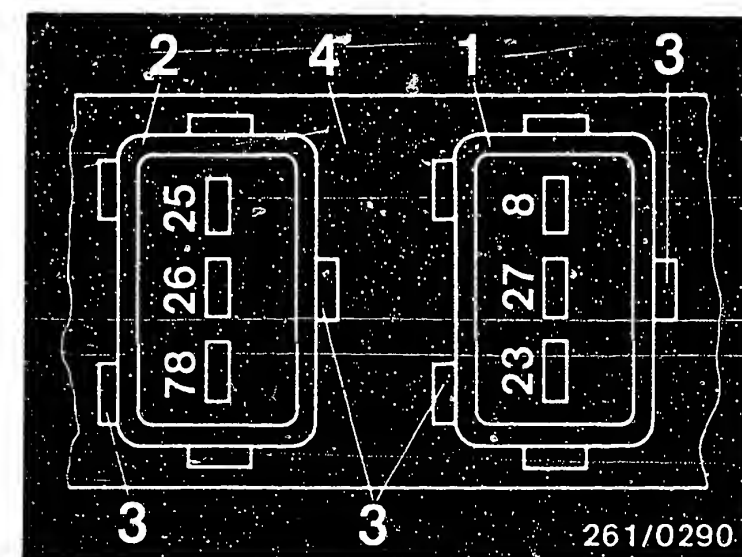


TEST STEP 4			
Operation		Reading	Testing
Program switch position "V"	↓	Ohmmeter must indicate 0.6 ... 1.6 kΩ	Component: Reference-mark sensor
Program switch position "Ω"	4		
Measuring equipment: Ohmmeter		<div>yes</div> <div>↓</div> <div>Continue testing with next test step</div>	Operation: Winding resistance between term. 25 and term. 26  Malfunction: Resistance not within tolerance
Measuring range: 0 to 10 kΩ			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition		no	



528e

- 1=Plug connector of engine-speed sensor
- 2=Plug connector of reference-mark sensor (marked)
- 3=Holding plate
- 1=Engine-speed sensor connector
- 2=Reference-mark sensor connector (marked)
- 3=Locating lugs
- 4=Holding plate



#### Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection: Corrosion, loose contact, (spring contacts must not allow themselves to be pushed back).
- Check leads from reference-mark sensor term. 25 and term. 26 to control-unit plug term. 25 and term. 26.
- Replace the sensor.

To replace the sensors, unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits on sensor. If necessary, apply two screwdrivers to the recesses left and right on the sensor and raise sensor.

Caution: Do not loosen the mounting.

Continued on D5/D6

**D3**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**D4**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



#### Trouble-shooting - TEST STEP 4 (continued)

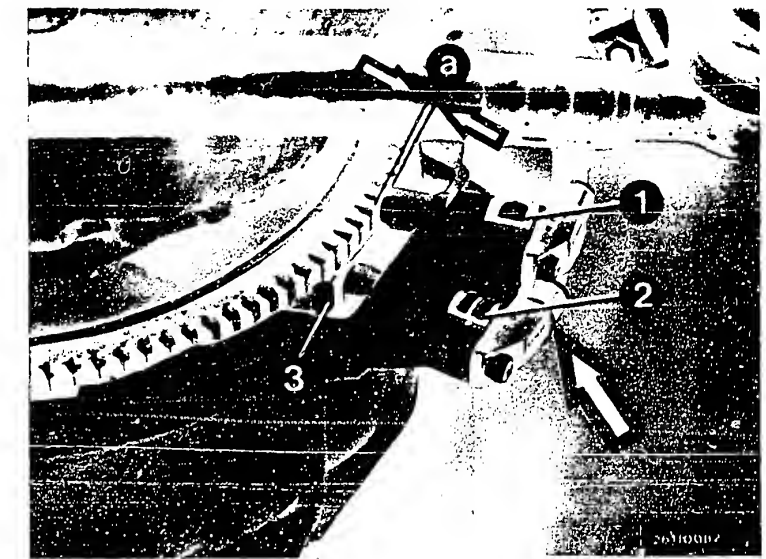
Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

#### Pay attention to markings:

The reference-mark sensor is marked by a cable binder.

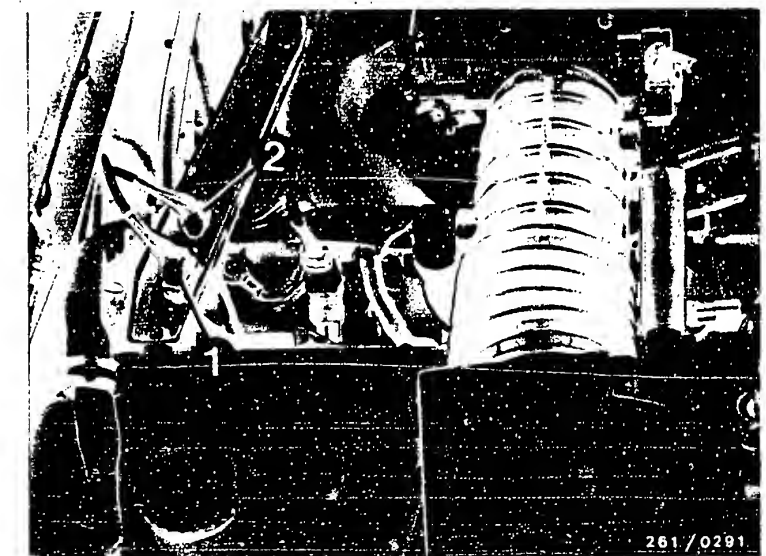
The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting. When mounting, make sure that the plug connectors are correctly assigned. Pay attention to the correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



1=Engine-speed sensor (D)  
2=Reference-mark sensor (B)  
(Arrow=Marking)  
3=Reference mark  
a=Air gap

5338,633CSi,733i:

1=Plug connector of engine-speed sensor  
2=Plug connector of reference-mark sensor (marked)



**D5**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

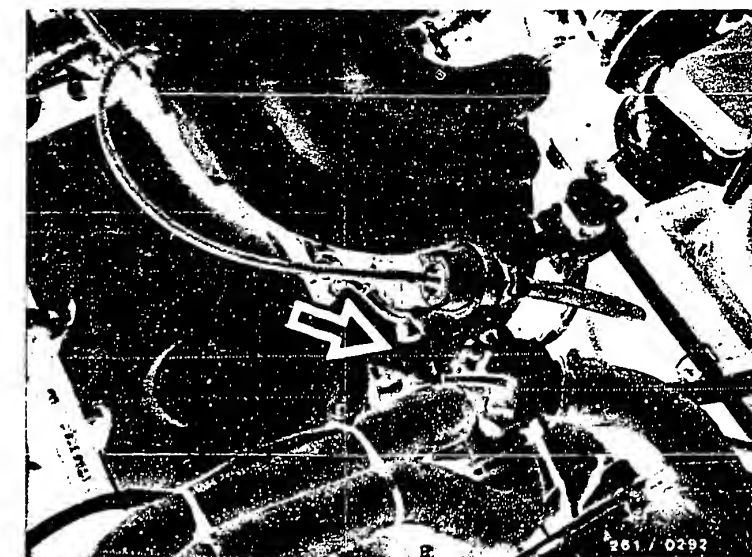


**D6**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



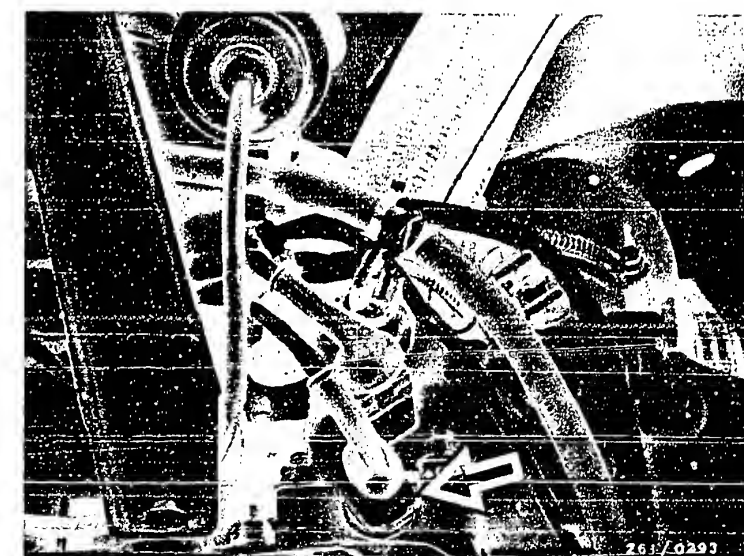
TEST STEP 5		Reading	Testing
Operation			
Program switch position "V"	↓	Reading is temperature-dependent, i.e. note engine temperature. At ambient temperature (+15°C...+30°C): 1.45 ... 3.3 kΩ With engine at op. temp. (approx. +80°C) 280 ... 360 Ω	<u>Component:</u> Engine temperature sensor (NTC II)
Program switch position "Ω"	5		
Measuring equipment: Ohmmeter			<u>Operation:</u> Resistance between term. 13 and ground
Measuring range: 0 to 10 kΩ			
Connection: Test sockets	Ω	yes ↓ Continue testing with next test step	<u>Malfunction:</u> Resistance not within tolerance. Pay attention to temperature.
Operation in vehicle: Switch off ignition.		no ↓	



528e:

Arrow=Engine temperature sensor (NTC II), white plug

533i,633CSi,733i



#### Trouble-shooting:

- Disconnect plug from temperature sensor and measure resistance directly. If necessary, replace temperature sensor.
- Check leads from temperature sensor to multiple plug term. 13 and to ground terminal.
- Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back.

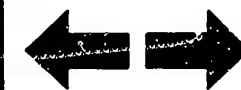
**D7**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**D8**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 6			
Operation		Reading	Testing
<u>Program switch position "V"</u>	↓	Reading is temperature-dependent, i.e. note engine temperature. At ambient temperature (+15°C...+30°C): <u>1.45 ... 3.3 kΩ</u>  With engine at op. temp. (approx. +80°C) <u>280 ... 360 Ω</u>	<u>Component</u>  Air temperature sensor (NTC II)
<u>Program switch position "Ω"</u>	6		
<u>Measuring equipment:</u>  Ohmmeter			<u>Operation:</u>  Resistance between term. 22 and ground.
<u>Measuring range:</u>  0 to 10 kΩ			
<u>Connection:</u>  Test sockets	Ω	yes ↓ <u>Continue testing with next test step</u>	<u>Malfunction:</u>  Resistance not within tolerance. Pay attention to temperature.
<u>Operation in vehicle:</u>  Switch off ignition		no ↓	

#### Trouble-shooting:

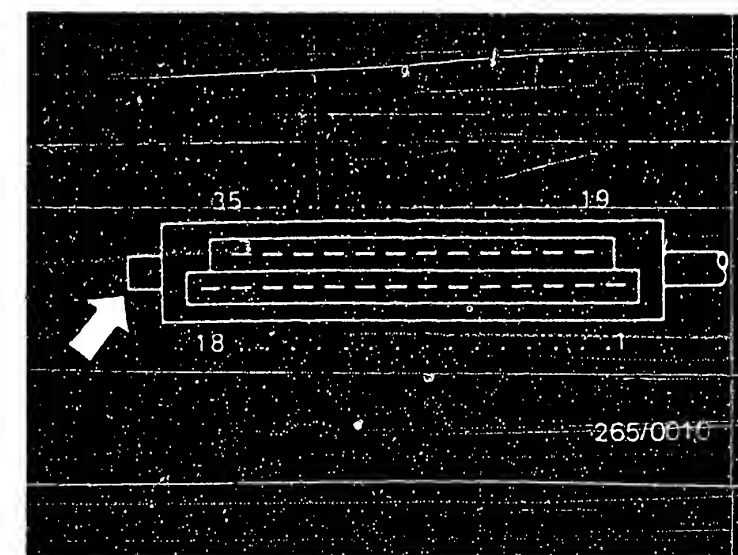
- Disconnect plug from air-flow sensor and measure resistance directly at term. 22 and term. 6. If reading not within tolerance, replace air-flow sensor.
- Leads from air-flow sensor term. 6 and term. 22 to control-unit plug term. 6 and term. 22.
- Eliminate contact resistances in the plug-in connections. Spring contacts must not allow themselves to be pushed back.



528e

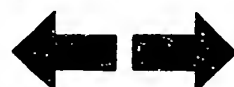
1=Air-flow sensor with NTC I  
2=Idle-mixture-adjusting screw  
3=Air filter

Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding



D9

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

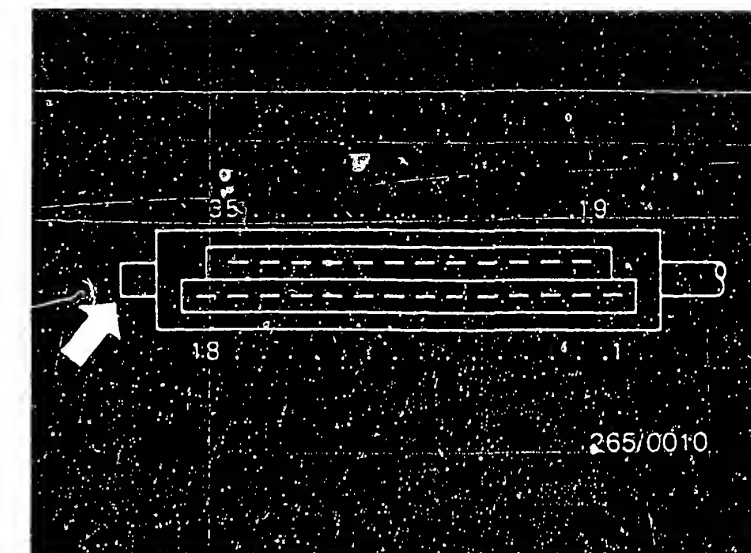


D10

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 7		
Operation		Reading
Program switch position "V"	↓	$\infty \Omega$
Program switch position "Ω"	7	
Measuring equipment: Ohmmeter		
Measuring range:		
0 to 10 kΩ		
Connection:		
Test sockets	Ω	
Operation in vehicle:		
Switch off ignition		
		yes
		no
		Continue testing with test step 9. (Test step 8 not applicable)
Testing		
Component:		Lead for map selection
Operation:		Connection between term. 10 and ground
Malfunction:		Resistance less than $\infty \Omega$



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

#### Trouble-shooting:

- Take apart connection between control-unit plug term. 10 and ground.

**D11**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



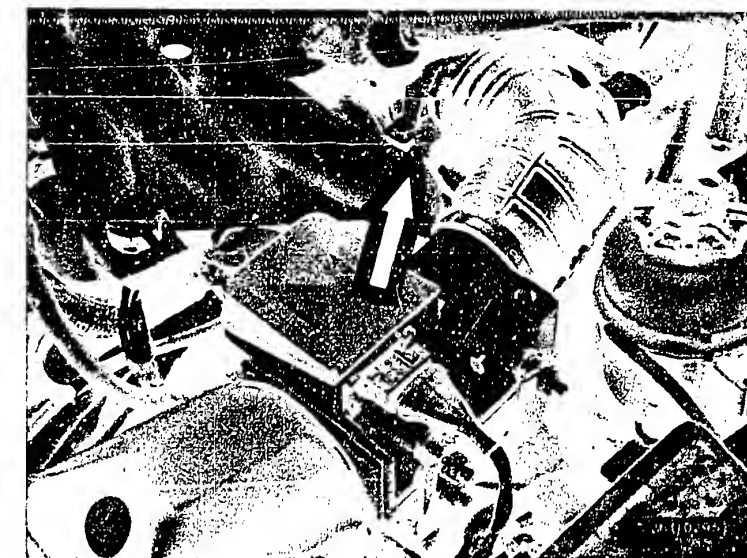
**D12**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





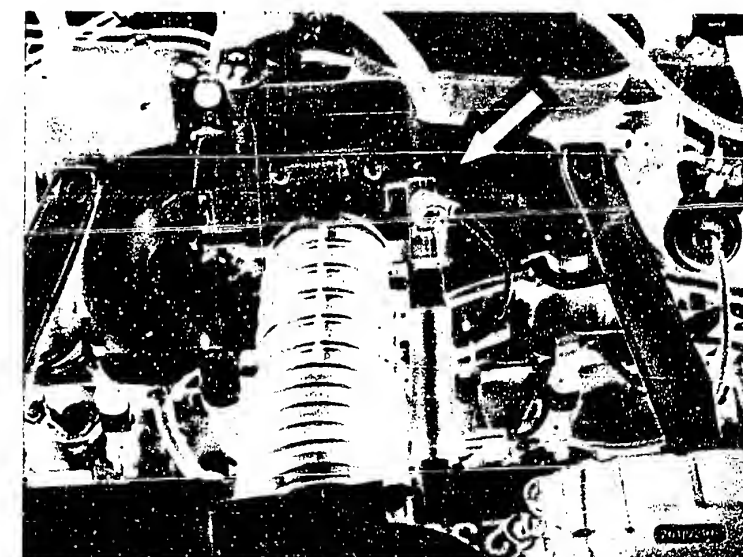
TEST STEP 9		(Test step 8 not applicable)	
Operation		Reading	Testing
Program switch position "V"	↓	Accelerator in rest position:	Component: Throttle-valve switch
Program switch position "Ω"	9	less than 10 Ω	Operation: Idle contact between terminal 2 and ground
Measuring equipment:		(measured value is influenced by protective resistor in adapter)	
Ohmmeter		Press accelerator (Part-load range)	Malfunction: Resistance in rest position greater than 10 Ω or less than ∞Ω.
Measuring range:		∞Ω 1)	
0 to 10 kΩ		yes no	
Connection:	Ω	↓	
Test sockets		Continue testing with next test step	
Operation in vehicle:			
Switch off ignition			



528e:

Arrow=Throttle-valve switch

533i,633CSi,733i



#### Trouble-shooting:

##### 1) Adjusting the throttle-valve switch:

Loosen fastening screws. Turn actuating lever to wide-open throttle and slowly return to idle stop.

Turn switch in a clockwise direction until the contact noticeably switches (reading less than 10 Ω).

Tighten screws.

Continued on D15/D16

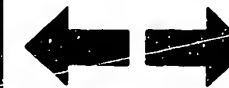
**D13**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**D14**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



## Trouble-shooting - Throttle-valve switch (continued)

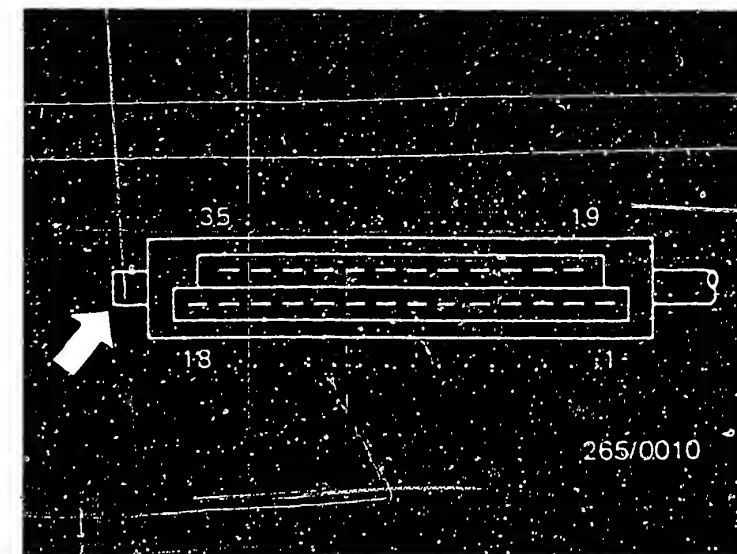
Check: Slowly open throttle in full-load direction. Reading must change to  $\infty \Omega$  shortly after the throttle has been opened.

If adjustment not possible:

Check throttle-valve switch (idle contact) as well as leads from throttle-valve switch to control-unit plug term. 2 and to ground terminal.

Eliminate contact resistances.

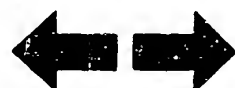
Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding.

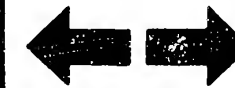
**D15**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



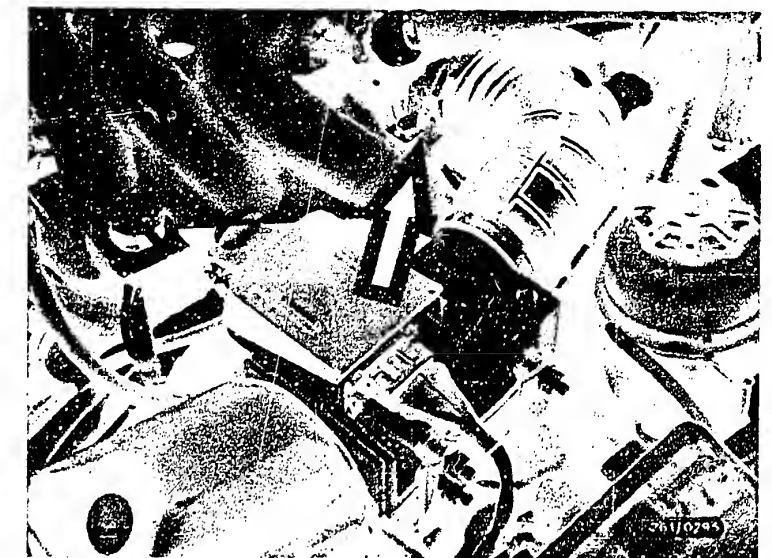
**D16**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





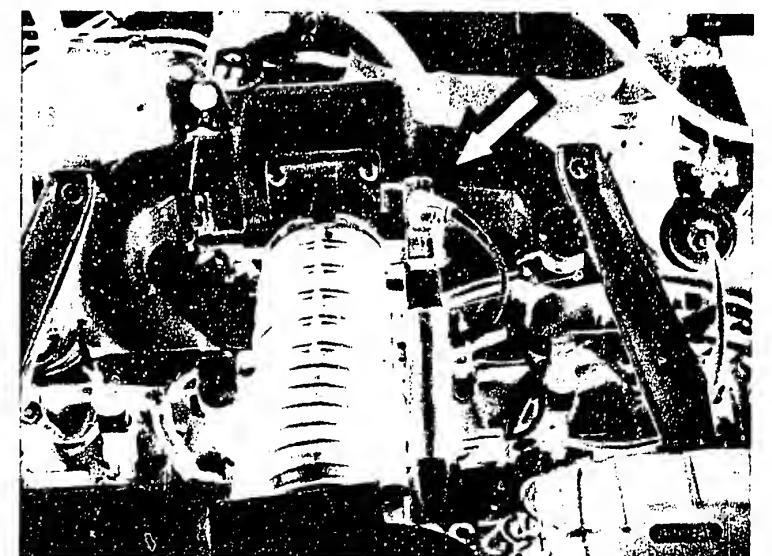
TEST STEP 10		Reading	Testing
Operation			
Program switch position "V"	↓	Accelerator in part-load position:	Component: Throttle-valve switch
Program switch position "Ω"	10	Accelerator in full-load position:	
Measuring equipment:		less than 10 Ω <sup>1)</sup>	Operation: Full-load contact between terminal 3 and ground
Ohmmeter		(measured value is influenced by protective resistor in adapter)	
Measuring range:			Malfunction: Resistance at full load greater than 10 Ω or ∞Ω.
0 to 10 kΩ		yes	
Connection:		↓	
Test sockets	Ω	Continue testing with next test step	
Operation in vehicle:			
Switch off ignition			



528e:

Arrow=Throttle-valve switch

533i, 633CSi, 733i



#### Trouble-shooting:

1) Check: Actuate throttle valve in full-load direction. Just before actuating lever reaches the full-load stop reading to values less than 10 Ω (full-load contact closed).

Reading greater than 10 Ω or ∞ Ω:

Check whether throttle valve is opening fully. Check bowden cable from accelerator to throttle valve.

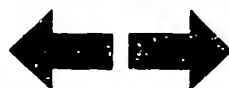
Check throttle-valve switch as well as lead from throttle-valve switch term. 3 to control-unit plug term. 3.

Eliminate contact resistances.

Spring contacts must not allow themselves to be pushed back.

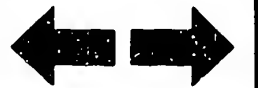
**D17**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**D18**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 11		Reading	Testing
Operation			
Program switch position "V"	↓	less than 10 $\Omega$ (measured value is influenced by protective resistor in adapter)	Component: Ground lead
Program switch position " $\Omega$ "	11		
Measuring equipment:		<div> <div>yes</div> <div>no</div> </div>	Operation: Contact resistance between term. 16 and ground
Ohmmeter			
Measuring range:			
0 to 10 k $\Omega$			
Connection:		Continue testing with next test step	Malfunction: Resistance greater than 10 $\Omega$
Test sockets	$\Omega$		
Operation in vehicle:			
Switch off ignition			

#### Trouble-shooting:

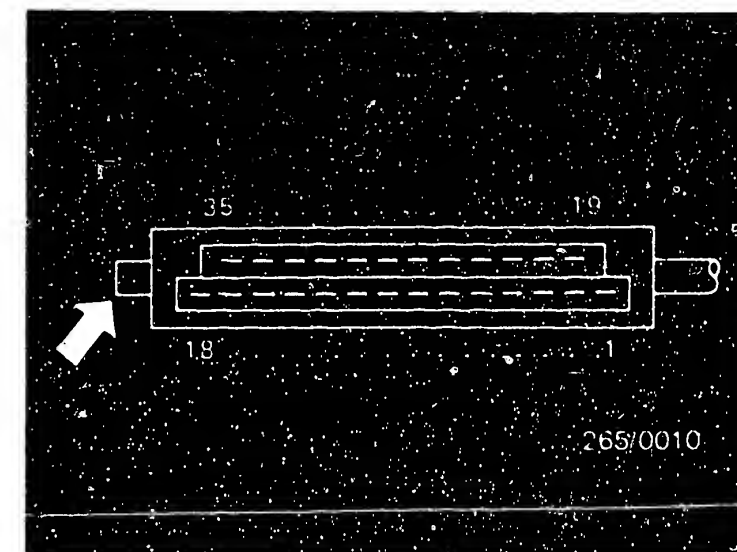
For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter  
(Set value approx. 0 $\Omega$ ):

- From control-unit plug term. 16 to ground terminal.
- From control-unit plug term. 5 to ground terminal.

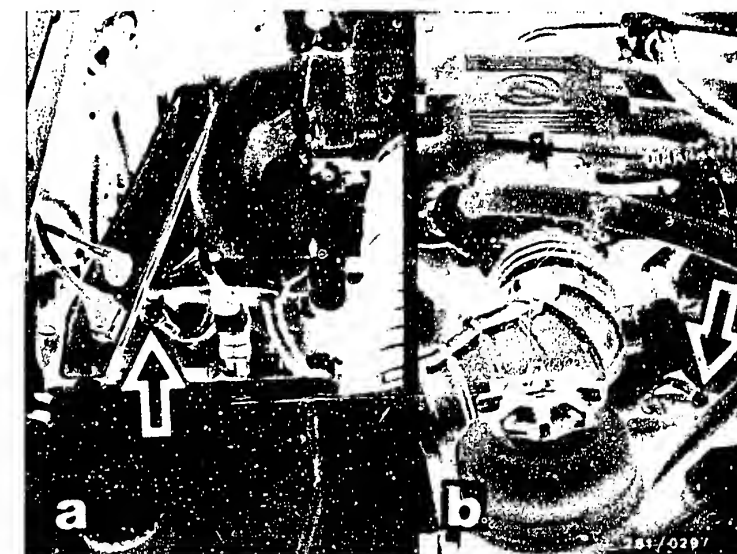
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.



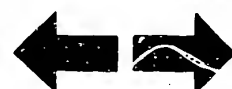
Top view of control-unit plug (35-pin) with terminal numbers.  
Arrow="Lug" with mechanical encoding

Arrow=Ground terminal  
Picture a=533i,633CSi,733i  
Picture b=528e



**D 19**


Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**D 20**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 12		
Operation	Reading	Testing
Program switch position "V" 	less than 10 $\Omega$ (measured value is influenced by protective resistor in adapter)	Component: Ground lead
Program switch position " $\Omega$ " 12		
Measuring equipment: Ohmmeter	<div>yes</div> <div>no</div>	Operation: Contact resistance between term. 17 and ground
Measuring range: 0 to 10 k $\Omega$		Malfunction: Resistance greater than 10 $\Omega$
Connection: Test sockets $\Omega$		
Operation in vehicle: Switch off ignition		

#### Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

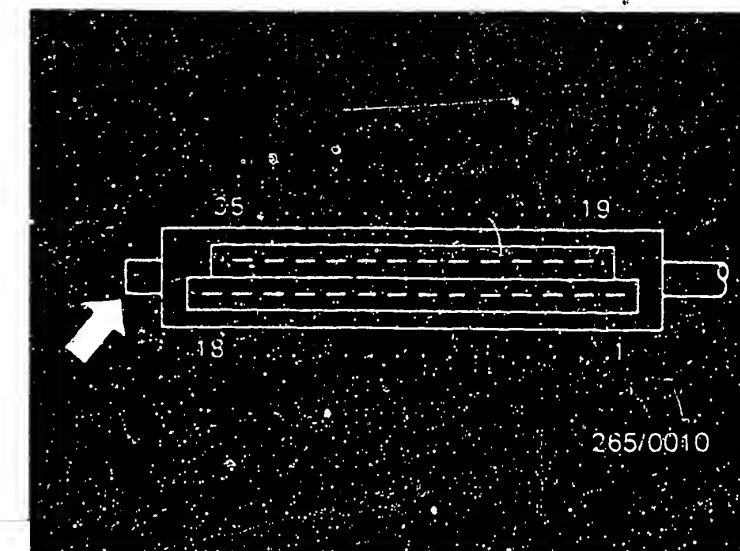
Check the following leads for continuity with ohmmeter  
(Set value approx. 0 $\Omega$ ):

From control-unit plug term. 17 to ground terminal.

From control-unit plug term. 5 to ground terminal.

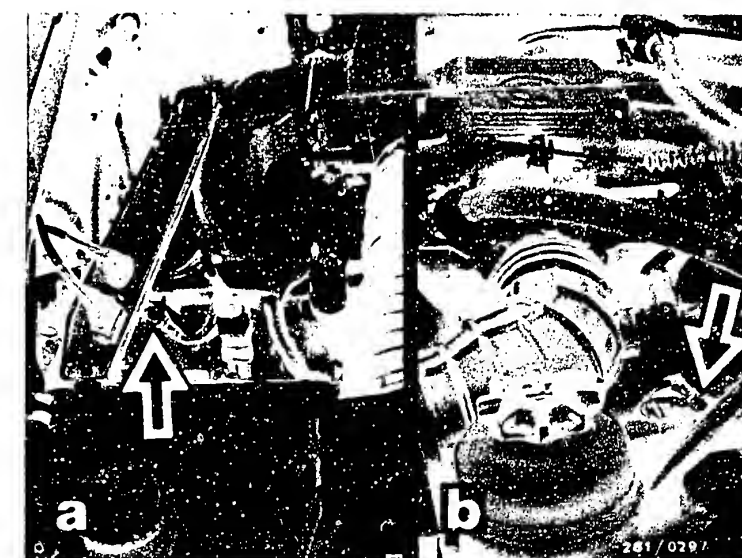
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back



Top view of control-unit plug (35-pin) with terminal numbers.  
Arrow="Lug" with mechanical encoding

Arrow=Ground terminal  
Picture a=533i,633CSi,733i  
Picture b=528e



**D21**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**D22**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 13		Reading	Testing
Operation			
Program switch position "V"	↓	less than 10 $\Omega$  (Measured value is influenced by protective resistor in adapter)	Component: Ground lead
Program switch position "Ω"	13		
Measuring equipment:		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">             yes ↓ Continue testing with next test step           </div> <div style="text-align: center;">             no ↓           </div> </div>	Operation: Contact resistance between term. 19 and ground
Ohmmeter			
Measuring range:			
0 to 10 k $\Omega$			
Connection:			Malfunction: Resistance greater than 10 $\Omega$
Test sockets	Ω		
Operation in vehicle:			
Switch off ignition			

#### Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter

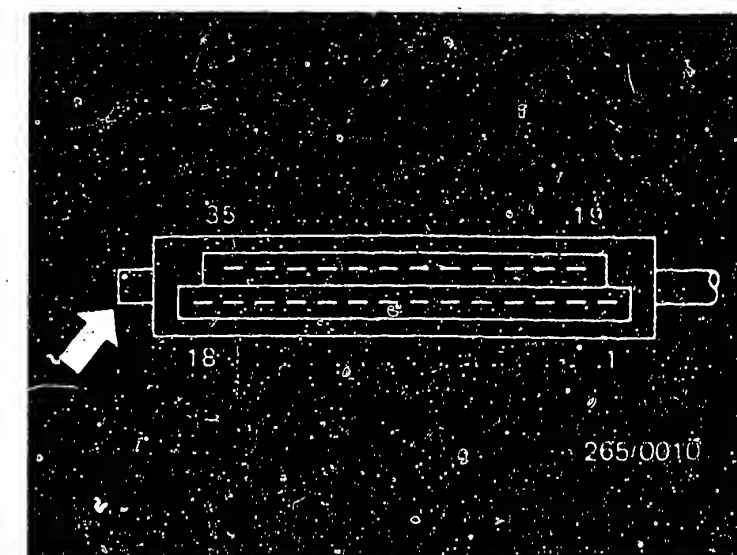
(Set value approx. 0 $\Omega$ ):

From control-unit plug term. 19 to ground terminal.

From control-unit plug term. 5 to ground terminal.

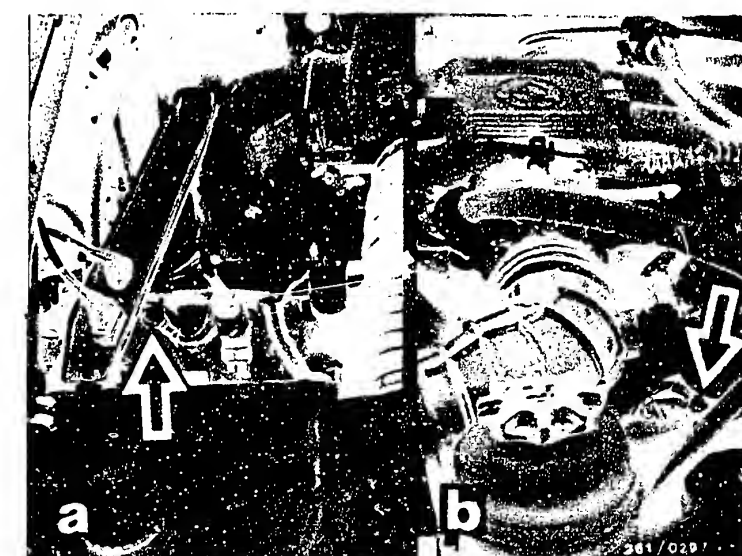
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.



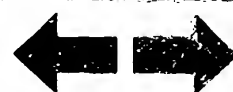
Top view of control-unit plug (35-pin) with terminal numbers.  
Arrow="Lug" with mechanical encoding

Arrow=Ground terminal  
Picture a=533i,633CSi,733i  
Picture b=528e



**D23**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

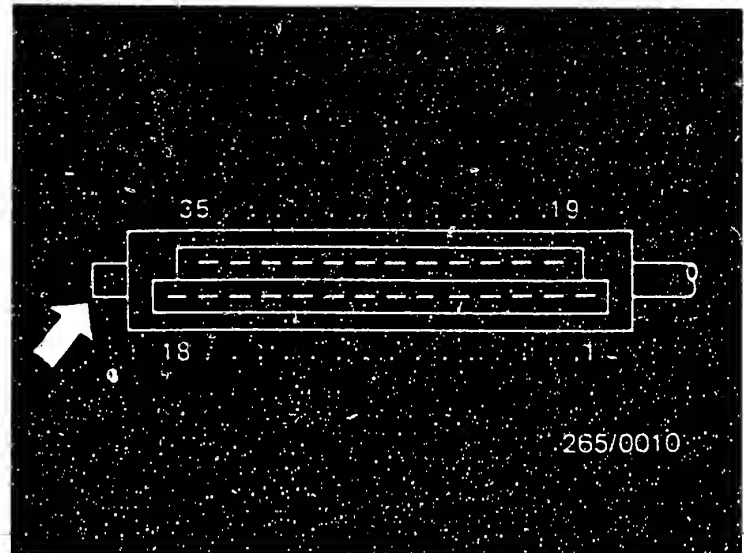


**D24**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 14/1: If altitude sensor (pressure sensor) (concerns 528e control unit 0 261 200 021 and ... 027)		
Operation	Reading	Testing
Program switch "V" at position:	0.4 ... 2.3 kΩ  (Reading depends on altitude. Dependence on altitude is tested in test step 14/2)	Component:  Altitude sensor (pressure sensor)
Program switch "Ω" at position:		
Measuring equipment:		
Ohmmeter	<div> <div>yes</div> <div>no</div> </div>	Operation:  Resistance between term. 30 and ground
Measuring range:		
0 to 10 kΩ		
Connection:	Continue testing with next test step	Malfunction:  Resistance not within tolerance
Test sockets		
Operation in vehicle:		
Switch off ignition		



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding.

Altitude sensor  
S=Wiper



Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter (Set value approx. 0 Ω):

- From control-unit plug term. 30 to altitude sensor
- From altitude sensor to ground terminal.

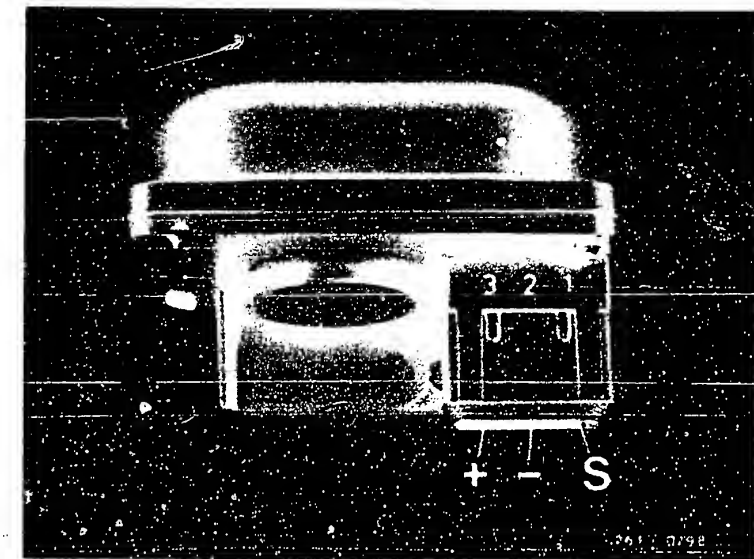
Eliminate contact resistances at the connection points.

Spring contacts must not allow themselves to be pushed back.

Replace altitude sensor.

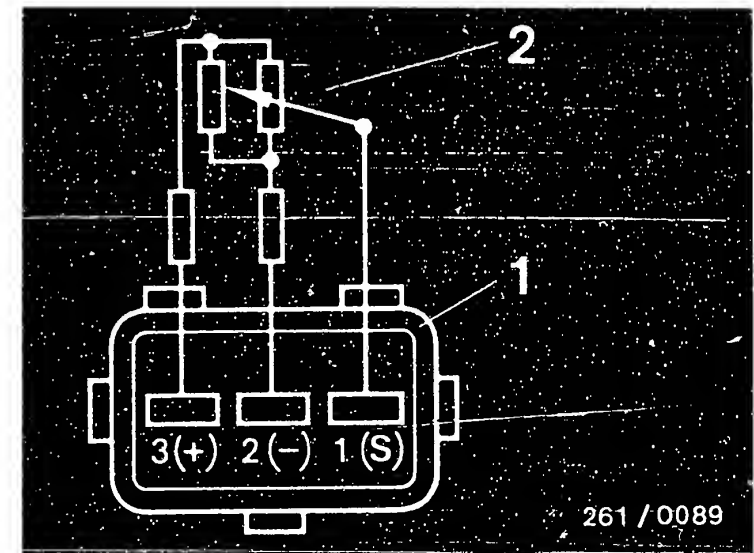


<b>TEST STEP 14/2: If altitude sensor (pressure sensor):</b> Caution: By way of exception, voltage is measured at the $\Omega$ sockets. Change over measuring instrument before switching on ignition.		
Operation		Reading
Program switch "V" at position:	↓	Voltage reading is dependent on altitude and battery voltage. With increasing battery voltage and altitude the wiper voltage at the altitude sensor increases.  0 m: 1.5 ... 3.5 V 500 m: 2.5 ... 5 V 1000 m: 3.5 ... 6.0 V 1500 m: 4.5 ... 7.5 V  ( $U_B$ between 10 V and 14 V).
Program switch "Ω" at position:	14	
Measuring equipment:		
Voltmeter		
Measuring range:		<b>Testing</b>  <b>Component:</b> Altitude sensor (pressure sensor)  <b>Operation:</b> Wiper voltage at pressure sensor measured between term. 30 and ground.  <b>Malfunction:</b> No voltage or voltage not within tolerance
15 V		
Connection:		
Test sockets	$\Omega$	
Operation in vehicle:		
Switch on ignition		



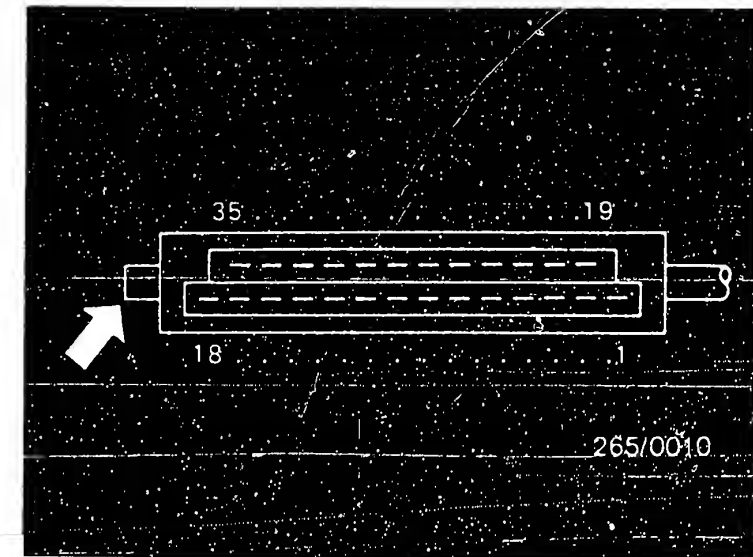
Altitude sensor  
S=Wiper

1=Top view of terminals on pressure sensor  
S=Potentiometer wiper  
2=Altitude sensor potentiometer



**Trouble-shooting:**  
**No voltage measurable:**  
 With test step 20, check whether main relay O.K.  
 If main relay O.K., check power supply (+) from main relay to altitude sensor.  
 If lead and plug connector O.K., replace pressure sensor.  
  
**Voltage not within tolerance:**  
 Note atmospheric pressure and battery voltage.  
 Replace altitude sensor.

TEST STEP 15/1		If lead for altitude compensation connected (up to 8.83 dependent on altitude of delivery location)	
Operation		Reading	Testing
Program switch "V" at position:		less than 10 Ω	Component:  Lead for altitude compensation
Program switch "Ω" at position:			
Measuring equipment:		yes no	Operation:  Connection between term. 28 and ground
Ohmmeter			
Measuring range:			
0 to 10 kΩ			
Connection:			
Test sockets		Continue testing with next test step	Malfunction:  Resistance greater than 10 Ω
Operation in vehicle:			
Switch off ignition.			



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

# Trouble-shooting:

- If necessary, establish connection between control-unit plug term. 28 and ground.

E5

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



E6

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



# TEST STEP 15/2 If altitude sensor (switch) (as of 8.83)

Operation		Reading	Testing
Program switch "V" at position:	↓	Above 1000 m altitude the contact is closed:	Component: Altitude sensor (switch)
Program switch "Ω" at position:	15	less than 10 Ω	
Measuring equipment: Ohmmeter		Below 1000 m altitude the contact is open:	Operation: Altitude dependence of contact term. 28 to ground (term. 5).
Measuring range: 0 to 10 kΩ		∞ Ω	
Connection:		<div> <div>yes</div> <div>no</div> </div>	Malfunction:  Resistance greater than 10 Ω or less than ∞ Ω.
Test sockets	Ω		
Operation in vehicle: Switch off ignition		Continue testing with next test step	

## Trouble-shooting:

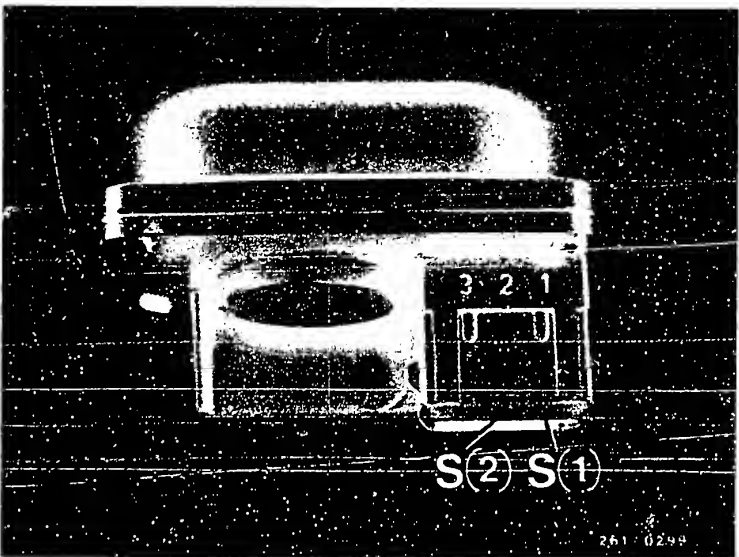
For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter  
(Set value approx. 0 Ω):

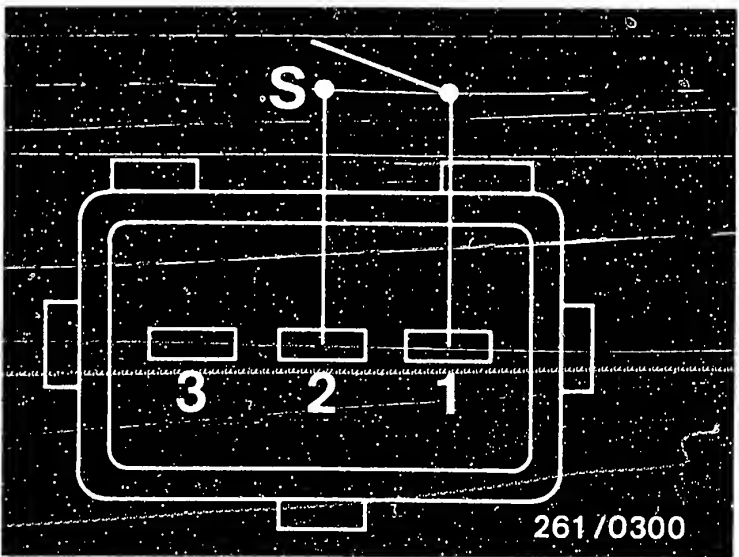
- From control-unit plug term. 28 to altitude sensor (switch).
- From ground to altitude sensor (switch).

Eliminate contact resistances at the connection points.

Spring contacts must not allow themselves to be pushed back.



1 = Altitude sensor (switch)  
S = Switch terminals



E7

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



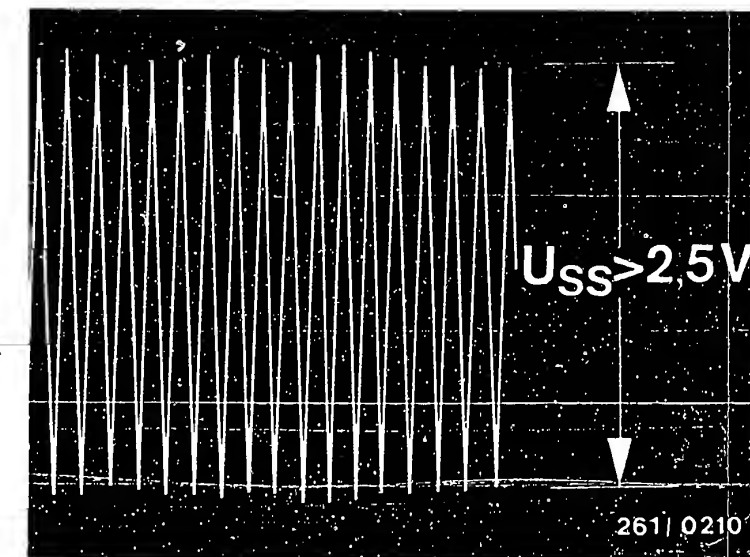
E8

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



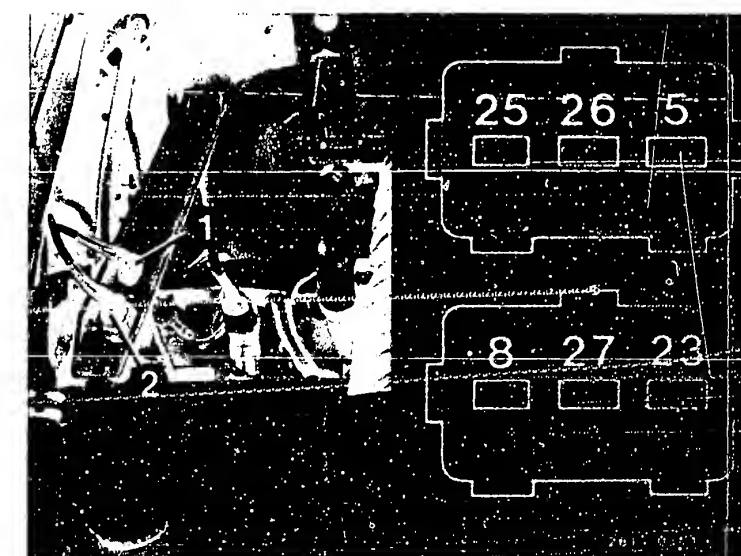


TEST STEP 16 Connect control unit for idle speed control.		
Operation	Reading	Testing
Program switch position "V"	1	Component: Engine-speed sensor
Program switch position "N"	15	
Measuring equipment: Motortester, oscilloscope	Engine-speed sensor signal (see top diagram) Lever to left-hand stop (calibrated voltage range).	Operation: Amplitude (signal) at terminals 8 and 27
Measuring range: Special input		
Connection: Test wells; red clip to red well, black clip to black well	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             yes ↓ Continue testing with next test step           </div> <div style="text-align: center;">             no ↓           </div> </div>	Malfunction: No signal or signal too small. Defective signal
Operation in vehicle: Shift gear to neutral and start		



Engine-speed sensor signal

533i, 633CSi, 733i:  
 1=Reference-mark sensor connector with grey plug  
 2=Engine-speed sensor connector with black plug



#### Trouble-shooting:

No signal or signal too small:

- Cranking speed less than 200 min<sup>-1</sup>; charge battery.
- Disconnect control unit for idle speed control, repeat test. If signal now O.K.: Replace control unit for idle speed control.

Continued on E11/E12

**E9**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**E10**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

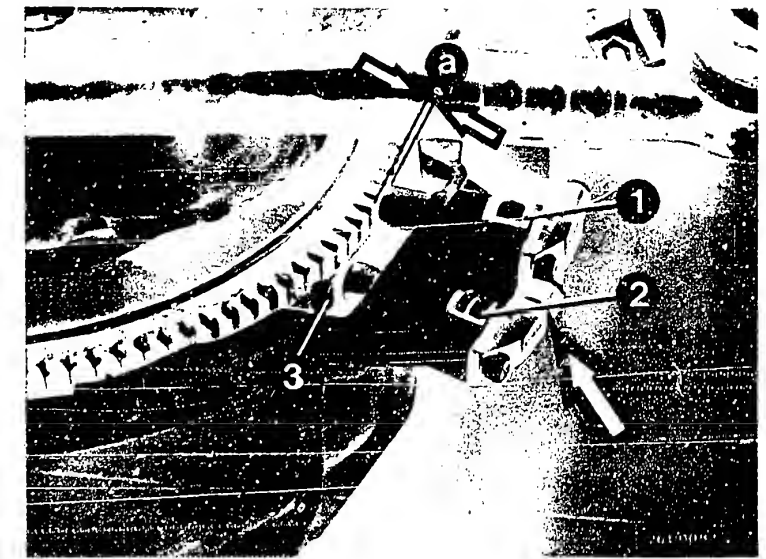


## Trouble-shooting - TEST STEP 16 (continued)

- Check nominal air gap  $a = 0.8$  mm:  
Remove ring gear housing cover plate.
- Replacing the engine-speed sensor:  
Unscrew hexagon-socket-head cap screw on sensor.  
Remove dirt deposits on sensor. If necessary, apply two screwdrivers to the recesses left and right on the sensor and raise sensor.
- Defective signal (greatly extended in bottom diagram):  
Heavily damaged tooth on starting-motor ring gear. Replace ring gear.

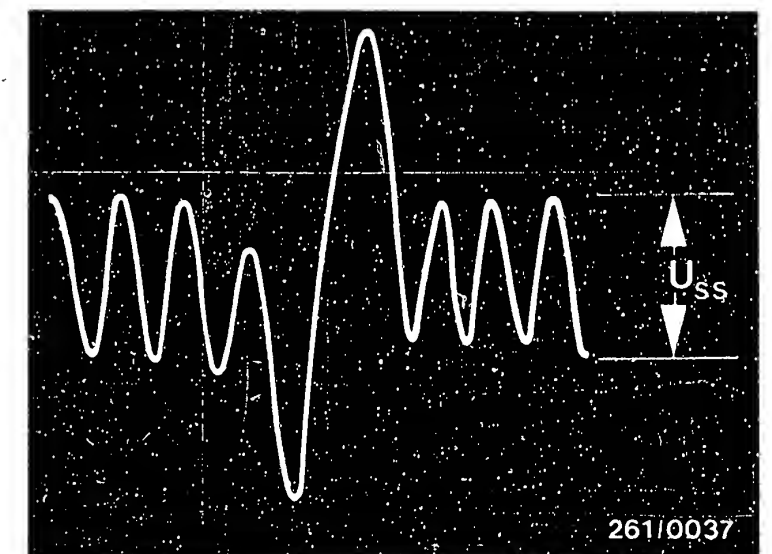
Before installing the sensors, make sure that there are no metal parts sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

Continued on E13



1=Engine-speed sensor (D)  
2=Reference-mark sensor (B)  
3=Reference mark  
a=Air gap  
Arrow=Marking for reference-mark sensor

Defective engine-speed sensor signal



**E11**

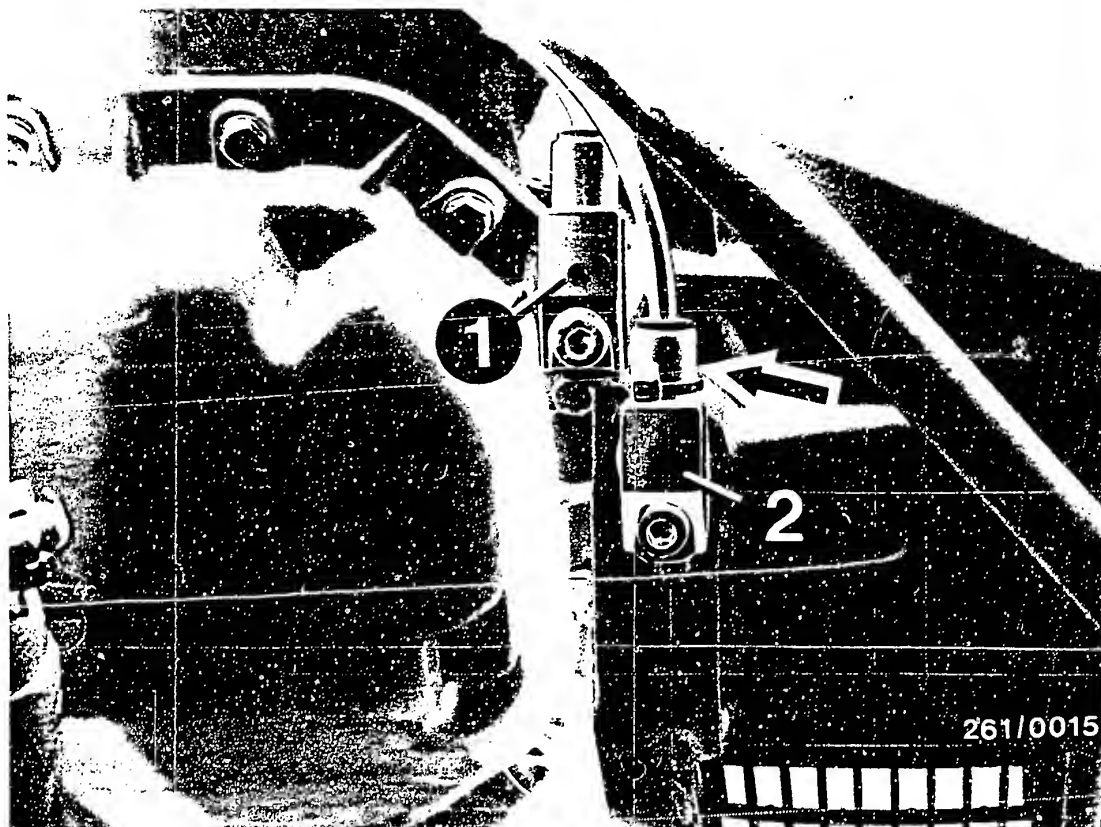
Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**E12**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





1 = Engine-speed sensor  
2 = Reference-mark sensor

Arrow=Marking for reference-  
mark sensor

Do not mix up the sensors when installing!

Pay attention to marking: Reference-mark sensor with marking and grey plug.

Engine-speed sensor without marking, black plug.

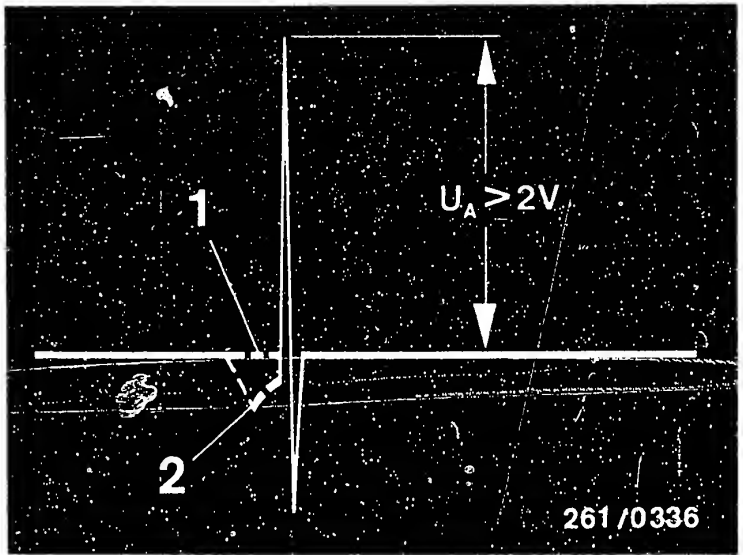
The sensors are inserted as far as they will go into the holes and screwed down. Do not use force when inserting.

When mounting, make sure that the connectors are correctly paired.

Ensure correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



TEST STEP 17			
Operation		Reading	Testing
Program switch position "V"	2	Reference-mark sensor signal (see top diagram)	Component: Reference-mark sensor
Program switch position "Ω"	15	Positive peak must come first. Lever all the way to the left (calibrated voltage range).	Operation: Amplitude (signal) at terminals 25 and 26
Measuring equipment: Motortester, oscilloscope			
Measuring range: Special input			
Connection: Test wells; red clip to red well, black clip to black well		If reading O.K., continue testing with next test step. (Test steps 18 and 19 not applicable).	Malfunction: No signal or signal too small. Incorrect signal. Negative peak coming first.
Operation in vehicle: Shift gear to neutral and start			



1=Automatic transmission  
2=Manual transmission

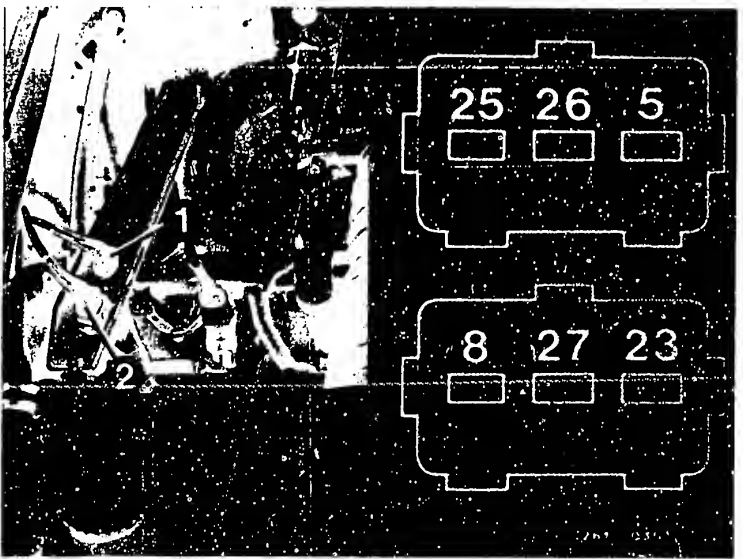
533i, 633CSi, 733i:  
1=Reference-mark sensor connector with grey plug  
2=Engine-speed sensor connector with black plug

Trouble-shooting:

Defective signal:

- Signal is incorrect if negative peak comes first. Check assignment of leads according to circuit diagram and picture opposite.

Continued on E16/E17



## Trouble-shooting - TEST STEP 17 continued)

No signal or signal too small:

- Cranking speed less than  $200 \text{ min}^{-1}$  - charge battery.
- Check nominal air gap  $a = 0.8 \text{ mm}$ :  
Remove ring-gear housing cover plate.  
The reference mark (3) can be brought up to the reference-mark sensor by turning the ring gear e.g. with a wrench.  
Measure the air gap (a) with a feeler gauge.
- Replacing the reference-mark sensor:  
Unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits on sensor. If necessary, apply two screwdrivers to the recesses left and right on the sensor and raise sensor.

Before installing the sensors, make sure that there are no metal parts sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

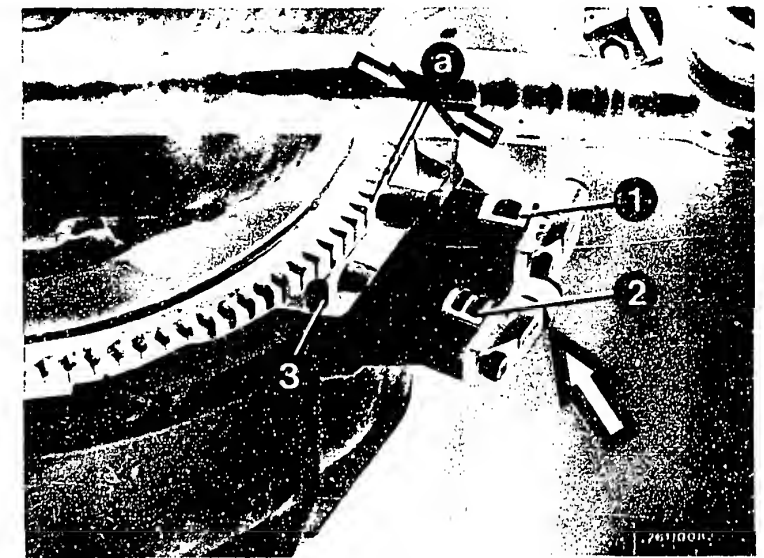
Do not mix up sensors with installing!

Pay attention to marking:

The reference-mark sensor is identified by the mark "B" and a cable binder.

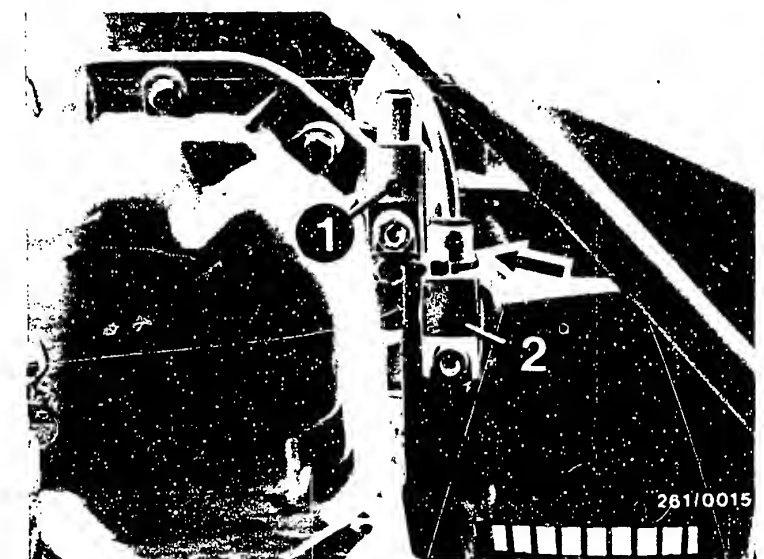
The sensors are inserted as far as they will go into the holes and are screwed down. Do not use force when inserting.

Continued on E18



1=Engine-speed sensor (D)  
2=Reference-mark sensor (B)  
3=Reference mark  
a=Air gap  
Arrow=Marking for reference-mark sensor

1=Engine-speed sensor  
2=Reference-mark sensor  
Arrow=Marking on reference-mark sensor



**E16**

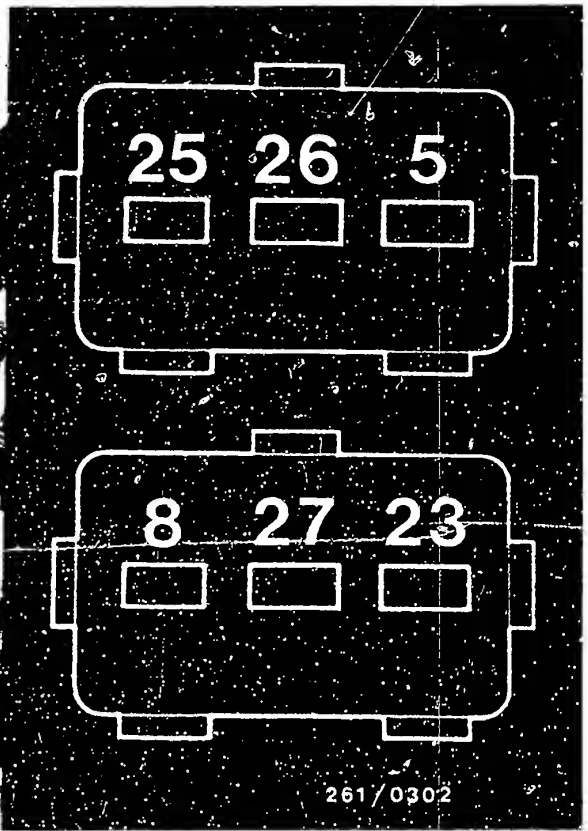
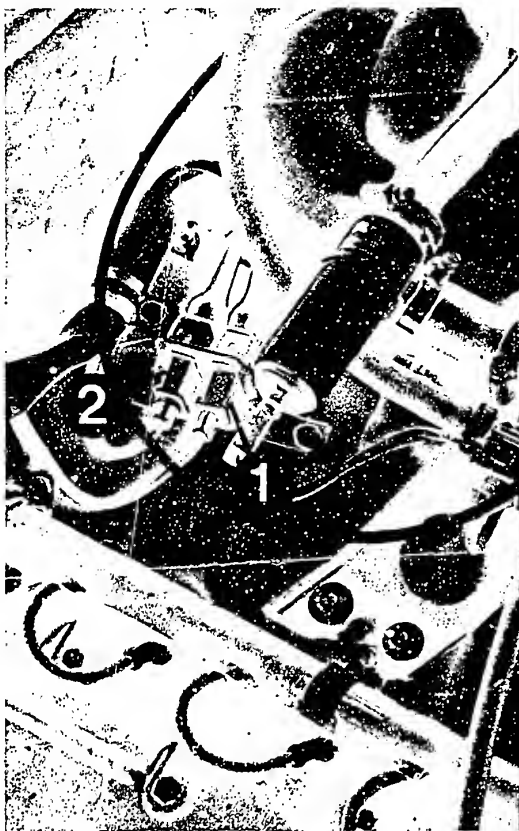
Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**E17**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





261/0302

528e:

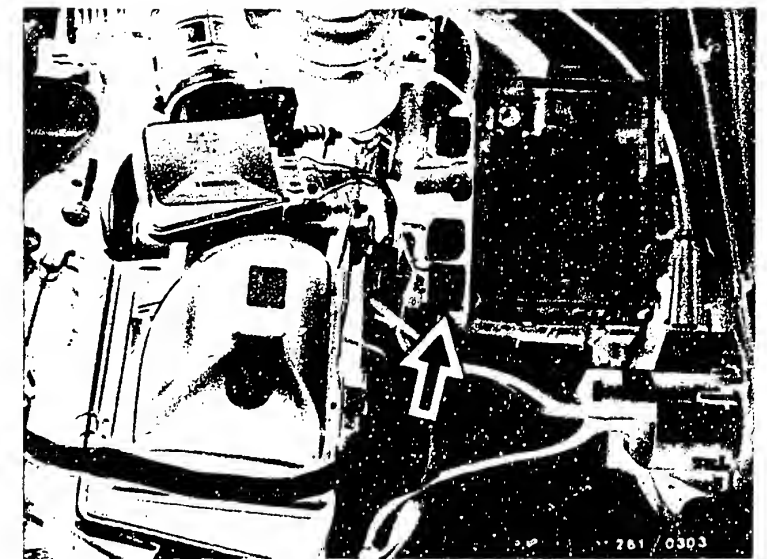
- 1 = Engine-speed sensor connector with black plug
- 2 = Reference-mark sensor connector with grey plug

When mounting, make sure that the connectors are correctly paired.

Ensure correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



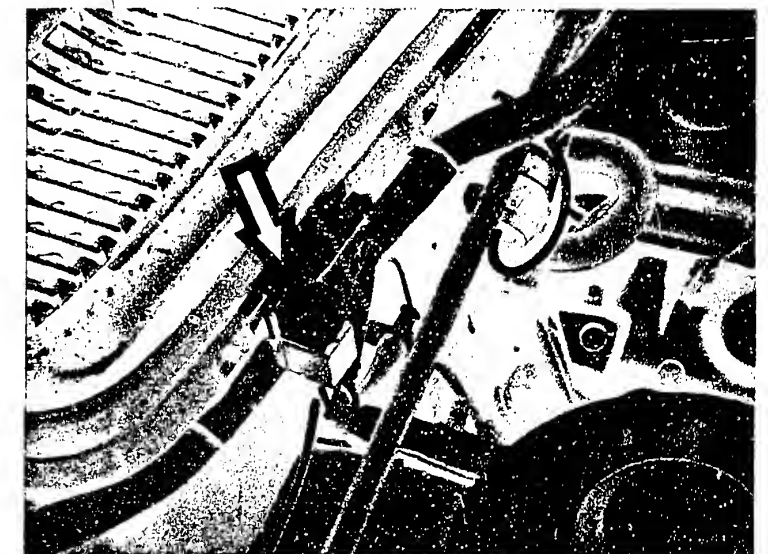
TEST STEP 20 (Test steps 18 and 19 not applicable)			
Operation		Reading	Testing
Program switch position "V"	6	10 ... 15 V	<u>Component:</u> Relay 2 (main relay) set
Program switch position "Ω"	15		
Measuring equipment:		<div>yes</div> <div>↓</div> Continue testing with next test step	<u>Operation:</u> Supply voltage for control unit at terminals 35 (+) and 5 (ground)
Voltmeter			
Measuring range:			
15 V			
Connection:		no	<u>Malfunction:</u> Voltage less than 10 V
Test sockets (red = +, black = ground)	V		
Operation in vehicle:			
Switch on ignition			



528e (533i and 633CSi similar)  
 Arrow=Relay 2 (main relay)

Note:  
 The position of the relays on the electrics box is not always the same as in the illustrations shown.

733i:  
 Arrow=Relay 2 (main relay)



### Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged or high voltage drops at terminals.

2. No voltage reading: Check relay 2.

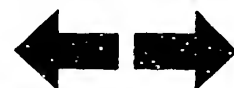
Perform the following voltage measurements on the relay with the ignition on:

- Measure battery voltage at term. 87 (2x), term. 86 and term. 30.
- Measure ground connection term. 85 to B+ (test adapter connected).
- Check lead from relay 2 term. 87 to control-unit plug term. 35.
- Check Motronic ground terminal, also lead 5.

Note: When replacing relay 2, make sure that only a relay with a blocking diode is installed. Note symbol on relay housing.

**E19**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)

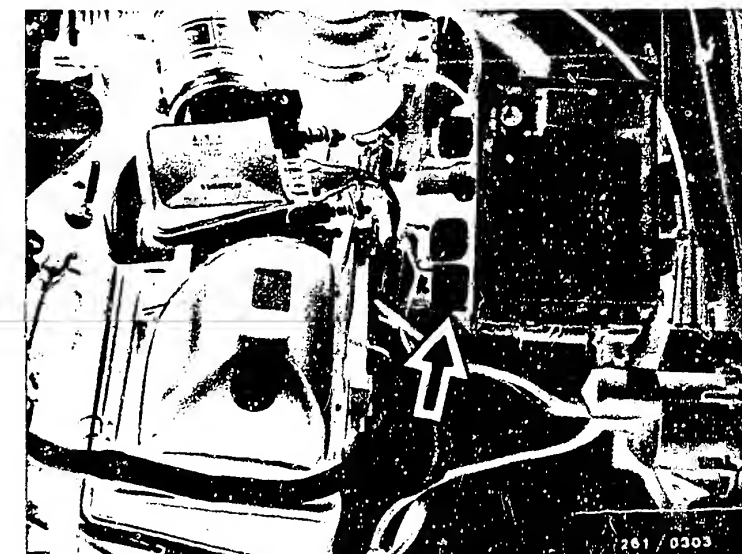


**E20**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



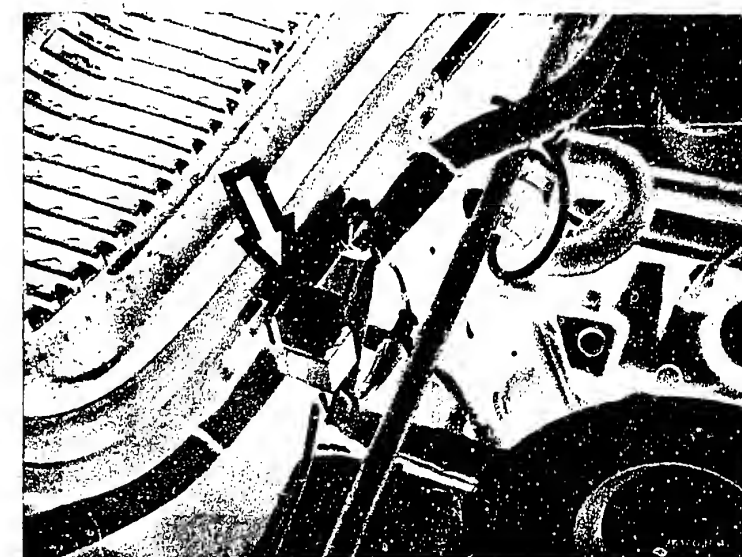
TEST STEP 21			
Operation		Reading	Testing
<u>Program switch position "V"</u>	7	<u>10 ... 15 V</u>	<u>Component:</u> Relay 2 (main relay) set
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Voltmeter		<div><div>yes</div><div>no</div></div>	<u>Operation:</u> Supply voltage for control unit at terminals 18 (+) and 5 (ground)
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Test sockets (red = +, black = ground)	V		<u>Malfunction:</u> Voltage less than 10 V
<u>Operation in vehicle:</u> Switch on ignition			



528e (533i and 633CSi similar)  
 Arrow=Relay 2 (main relay)

Note:  
 The position of the relays on the electrics box is not always the same as in the illustrations shown.

733i:  
 Arrow=Relay 2 (main relay)



#### Trouble-shooting:

- Check lead from control-unit plug term. 18 to relay 2 term. 87.

Note:  
 When replacing relay 2, make sure that only a relay with blocking diode is installed. Note symbol on relay housing.

**E21**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



**E22**

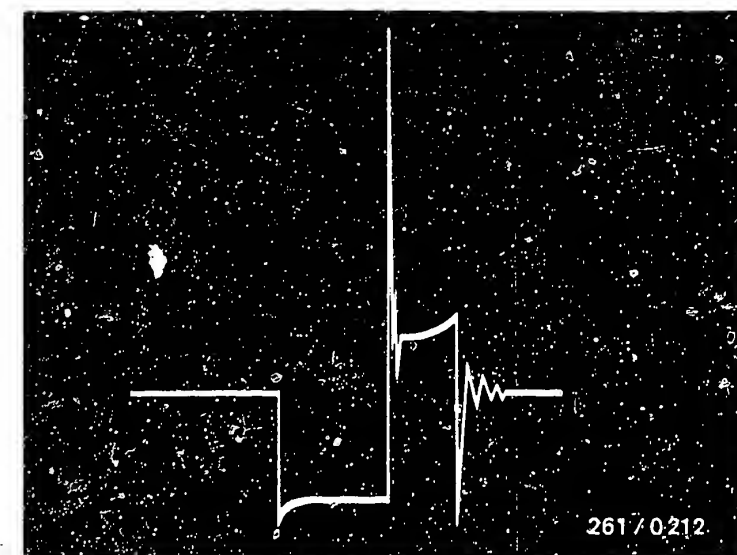
Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)





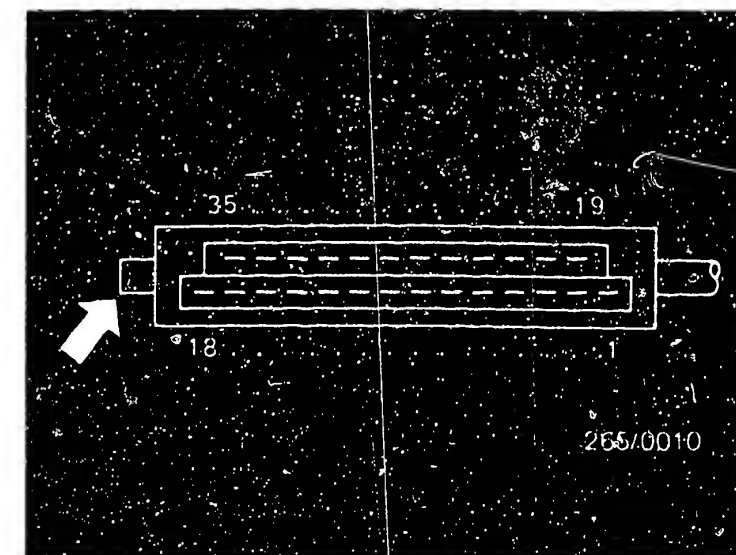
# TEST STEP 22 Ignition off. Connect Motronic control unit.

Operation		Reading	Testing
Program switch position "V"	5	Primary signal present (see top diagram)	<u>Component:</u> Ignition coil, ignition cables, control unit
Program switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope			
Measuring range: Special input			<u>Operation:</u> Primary signal from ignition coil terminal 1 to ground
Connection: Test wells; red clip to red well, black clip to black well. Triggering on cylinder 1		<div><div>yes</div><div>no</div></div> <div><div>↓</div><div>↓</div></div>	
Operation in vehicle: Shift gear to neutral and start		Continue testing with next test step	<u>Malfunction:</u> No signal or signal defective



Primary signal

Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding



## Trouble-shooting:

- Check Motronic ground terminals:  
Terminals must be bare down to the metal and screws must be securely tightened.
- Check ignition coil including leads and high-tension cables.  
Spring contact on control-unit plug term. 1 must not allow itself to be pushed back.
- Check lead from ignition coil term. 15 to ignition lock term. 15.
- Replace control unit.

## Note:

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have matching recesses and pins.

**E23**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

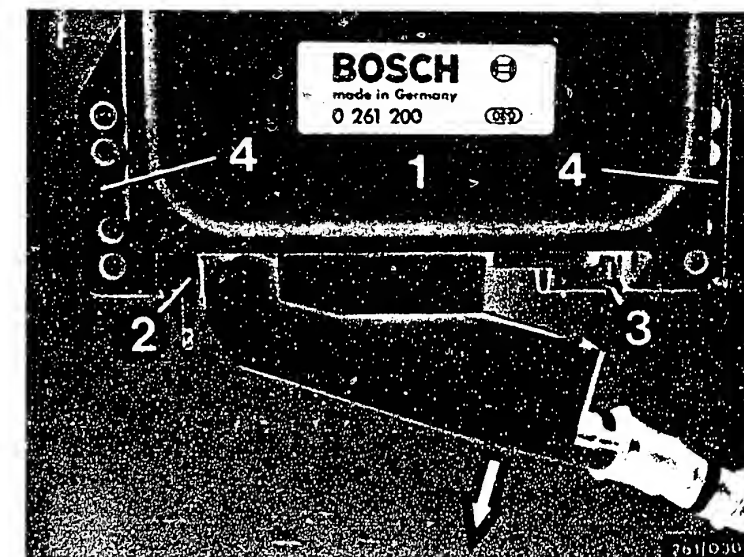


**E24**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

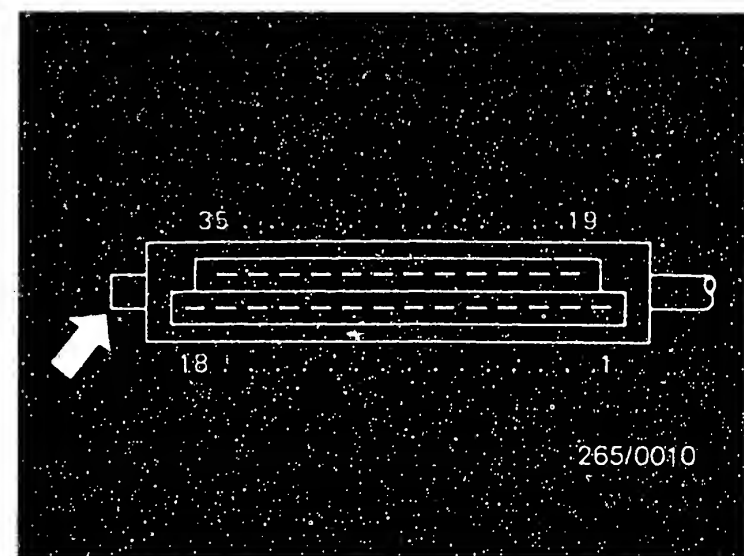


TEST STEP 23			
Operation		Reading	Testing
<u>Program switch position "V"</u>	8	Multimeter must indicate <u>greater than 8 V.</u>	<u>Component:</u> Control unit
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Voltmeter		<div><div>yes</div><div>↓</div><div>Continue testing with next test step.</div></div> <div>no</div> <div>↓</div>	<u>Operation:</u> Supply voltage for air-flow sensor at terminal 9 and ground
<u>Measuring range:</u> 15 V			
<u>Connection:</u> <u>Test sockets:</u> red = +, black = ground	V		
<u>Operation in vehicle:</u> Switch on ignition			
			<u>Malfunction:</u> Voltage less than 8 V



1=Control unit  
2=Lug  
3=Detent  
4=Mounting holes

Top view of control-unit plug (35-pin) with terminal numbers.  
Arrow="Lug" with mechanical encoding



#### Trouble-shooting:

- Check contacting at control-unit plug. Spring contact of term. 9 must not allow itself to be pushed back.
- Replace control unit.

#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have matching recesses and pins.

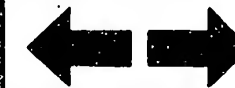
**F1**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

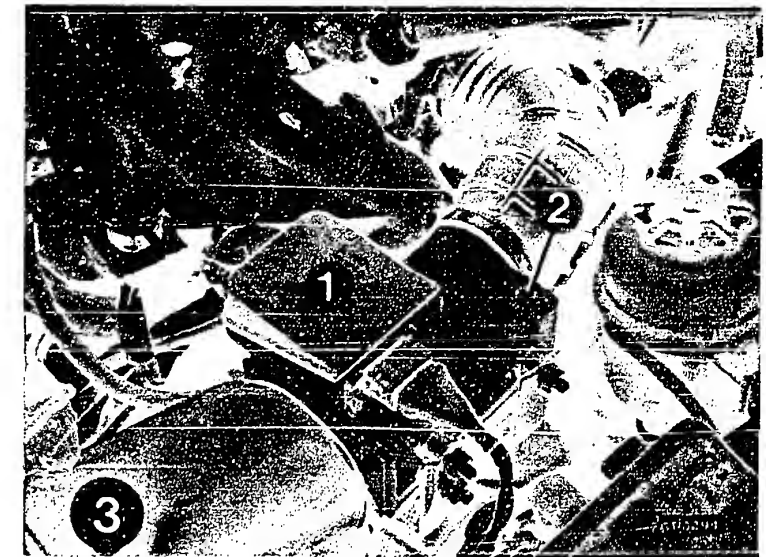


**F2**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

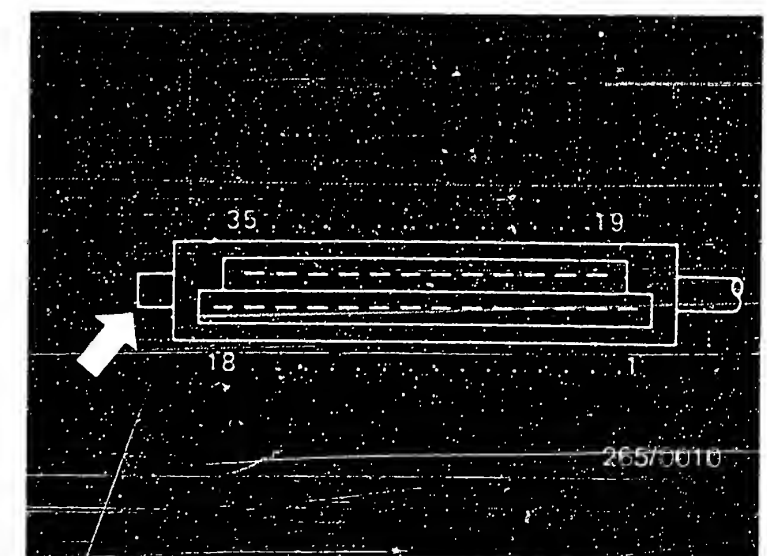


TEST STEP 24			
Operation		Reading	Testing
Program switch position "V"	9	Multimeter must indicate <u>150 ... 250 mV</u> with sensor flap closed. Loosen hose from air-flow sensor and open sensor flap by hand. Sensor flap must not catch and must return automatically to rest position when released. With sensor flap fully open, the reading rises to <u>above 7 V</u> (change over measuring range).  If reading O.K., continue testing with <u>test step 27</u> . Test steps 25 and 26 not applicable.	<u>Component:</u> Air-flow sensor
Program switch position "Ω"	15		
Measuring equipment: Multimeter (V range)			<u>Operation:</u> Divider voltage at terminal 7 and ground
Measuring range: 1.5 V			
Connection: Test sockets (red = +, black = ground)	V		<u>Malfunction:</u> No voltage or voltage less than 150 mV or greater than 250 mV
Operation in vehicle: Switch on ignition			



1=Air-flow sensor with NTC I  
2=Idle-mixture-adjusting screw

Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding



#### Trouble-shooting:

##### No reading:

- Check leads from air-flow sensor term. 6,7 and 9 to control-unit plug term. 6,7 and 9.
- Spring contacts must not allow themselves to be pushed back.

##### Reading not within tolerance:

- Check whether air-flow sensor flap is closing completely.
- Replace air-flow sensor.

**F3**

Test with universal test adapter  
BMW 5,6, and 7 series (USA, Japan)



**F4**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEPS 25 and 26 not applicable

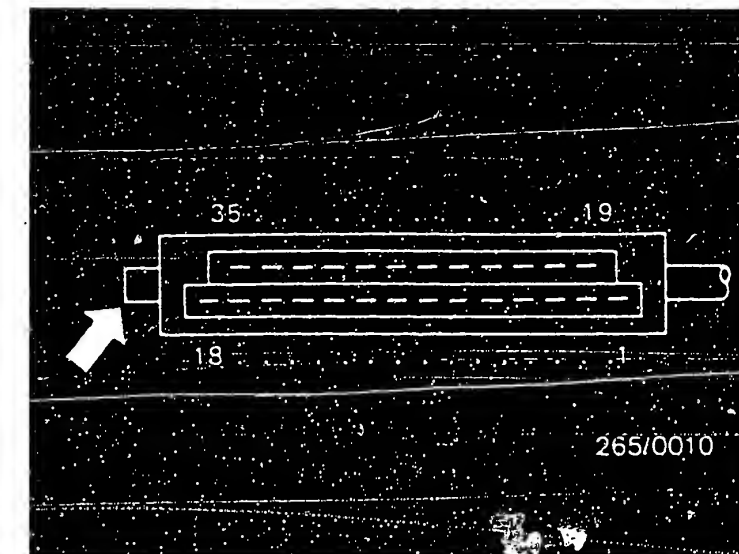
TEST STEP 27

Operation		Reading	Testing
<u>Program switch position "V"</u>	12	<u>8 ... 15 V</u> during cranking	<u>Component:</u> Lead 4 from starting motor term. 50 to control-unit plug term. 4
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Voltmeter		<div>yes</div> <div>no</div> <div>Continue testing with next test step.</div>	<u>Operation:</u> Voltage test at terminal 4
<u>Measuring range:</u> 15 V			<u>Malfunction:</u> Voltage less than 8 V
<u>Connection: Test sockets (red = +, black = ground)</u>	V		
<u>Operation in vehicle:</u> Shift gear to neutral and start			

Trouble-shooting:

1. Voltage less than 8 V:

- Check voltage drop across starting motor terminal 50.
- Check contacting on control-unit plug.  
Spring contact of term. 4 must not allow itself to be pushed back.
- Check lead from control-unit plug terminal 4 to starting motor terminal 50.



Top view of control-unit plug (35-pin) with terminal numbers  
Arrow="Lug" with mechanical encoding

F5

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

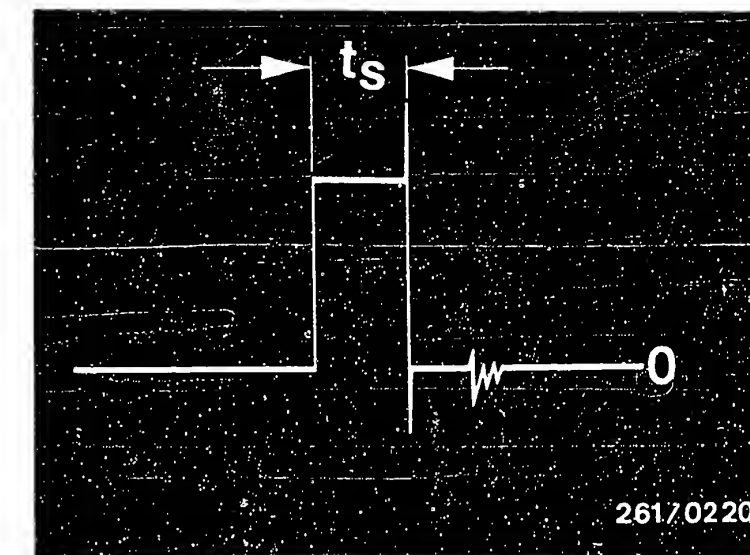


F6

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 28			
Operation		Reading	Testing
<u>Program switch position "V"</u>	13	Dwell-period signal (see top diagram)	<u>Component</u> Control unit
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Motortester, oscilloscope		<div><div>yes</div><div>no</div><div>Continue testing with next test step</div></div>	<u>Operation:</u> Dwell-period signal at terminal 21 and ground
<u>Measuring range:</u> Special input			<u>Malfunction:</u> No signal
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			
<u>Operation in vehicle:</u> Shift gear to neutral and start			



$t_s$  = Dwell period  
 $0_s$  = Base line

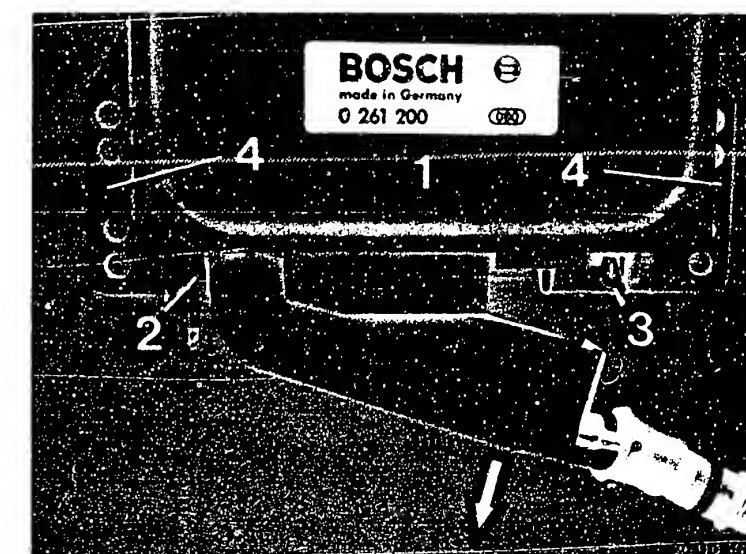
1=Control unit  
 2=Lug  
 3=Detent  
 4=Mounting holes

#### Trouble-shooting:

- Replace control unit.

#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



**F7**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



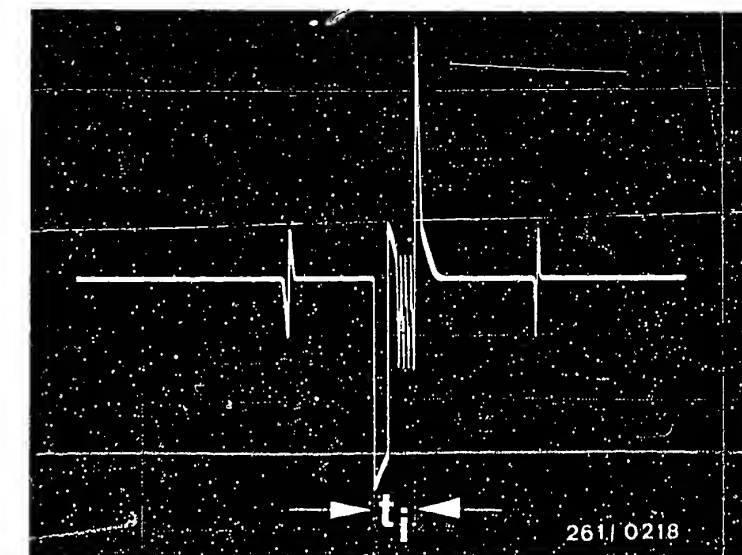
**F8**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)





TEST STEP 29			
Operation		Reading	Testing
Program switch position "V"	14	Injection signal at solenoid-operated injection valve (see top diagram)	<u>Component:</u> Power supply for solenoid-operated injection valves, control unit
Position switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope		<div> <div>yes</div> <div>no</div> </div>	<u>Operation:</u> Injection output stage at terminal 14 and ground
Measuring range: Special input			
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and start			
		Continue testing with next test step	<u>Malfunction:</u> No signal



Injection signal (at injection valve)  
 $t_i$  = Duration of injection

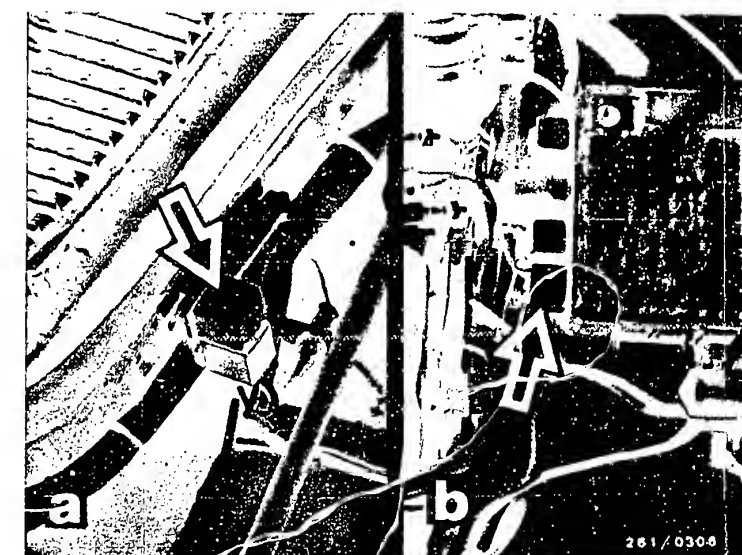
Arrow=Main relay (Relay 2)  
 (533i,633CSi similar to 528e)  
 Picture a=733i  
 Picture b=528e

#### Trouble-shooting:

- Check power supply to injection valves:  
 Disconnect connectors from all injection valves. Measure voltage at both terminals of the valve connectors. Battery voltage must be measured at each valve connector. If no voltage present, check lead from valve connector to relay 2 term. 87. The position of the relays on the electrics box is not always the same as in the illustrations shown.
- Check lead from control-unit plug term. 14 to the injection valves of cylinders 1,2 and 3.
- Replace control unit.

#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



**F9**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



**F10**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



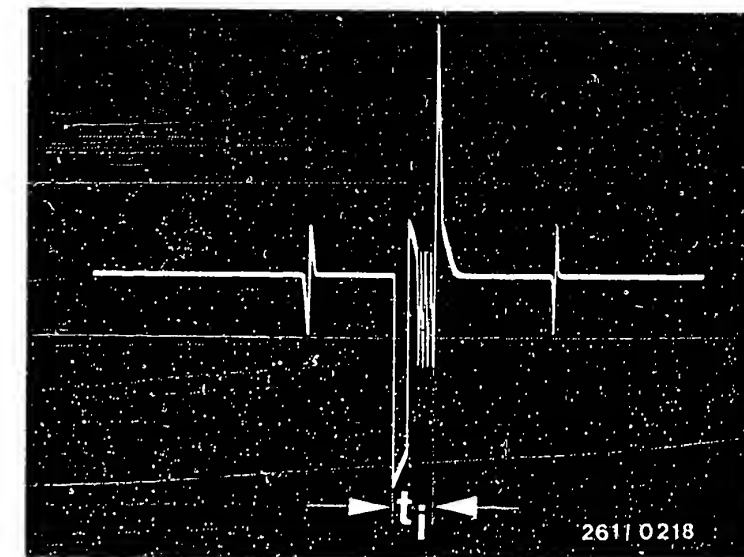
TEST STEP 30			
Operation		Reading	Testing
Program switch position "V"	14	Injection signal (see top diagram)  After pressing button T1 (NTC II, cold) duration of injection $t_i$ becomes slightly longer <u>Press T1 only briefly, otherwise engine is over-enriched.</u>	Component: Control unit
Position switch position "Ω"	15		Operation: Influence of temperature
Measuring equipment: Motortester, oscilloscope			
Measuring range: Special input		<div>yes</div> <div>no</div>	Malfunction: Signal does not become wider after T1 has been pressed
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and start			
Button Press T1		Continue testing with next test step	

#### Trouble-shooting:

- Replace control unit.

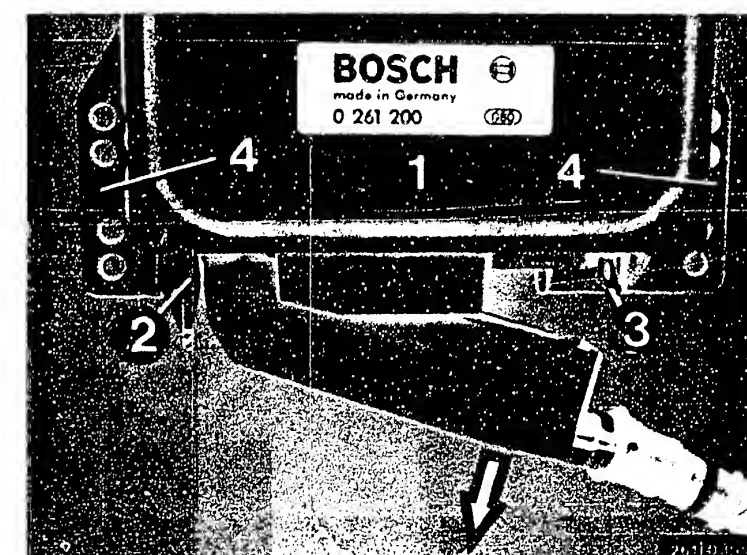
#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



Injection signal  
 $t_i$  = Duration of injection

- 1=Control unit
- 2=Lug
- 3=Detent
- 4=Mounting holes



**F11**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



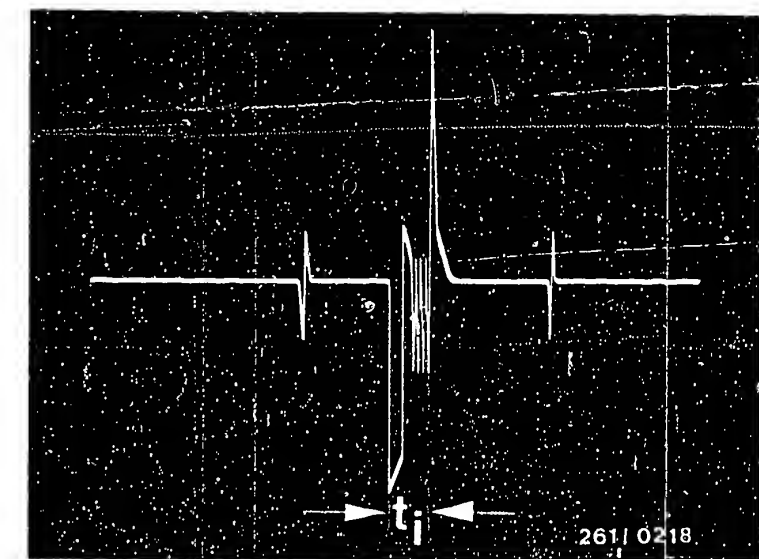
**F12**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





TEST STEP 31			
Operation		Reading	Testing
Program switch: position "V"	15	Injection signal at solenoid-operated injection valve (see top diagram)	Component: Control unit
Position switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">             yes ↓ Continue testing with next test step           </div> <div style="text-align: center;">             no ↓           </div> </div>	Operation: Injection output stage at terminal 15 and ground
Measuring range: Special input			Malfunction: No signal
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and start			



Injection signal  
t<sub>i</sub> = Duration of injection

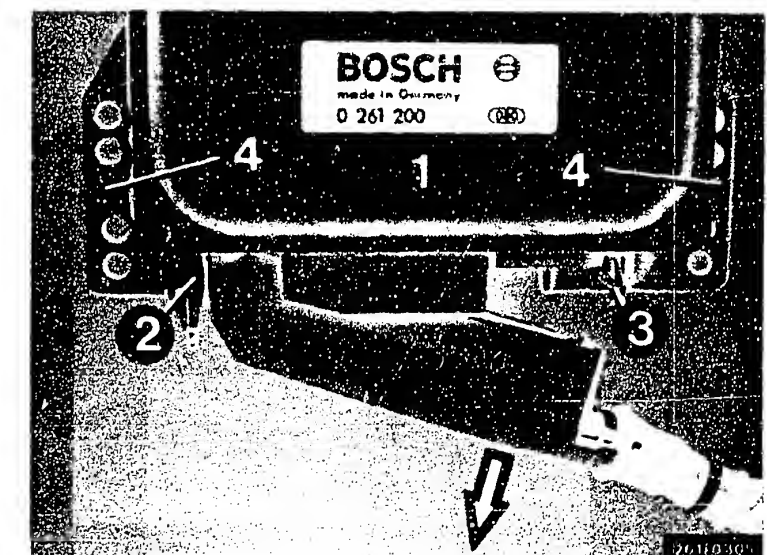
1=Control unit  
2=Lug  
3=Detent  
4=Mounting holes

#### Trouble-shooting:

- Power supply to solenoid-operated injection valves:  
Remove connectors from all injection valves and measure voltage to ground at both terminals. The battery voltage must be measured at each injection-valve connector. If no voltage, check lead through plug-in connection term. 2 to relay set term. 87.
- Check lead from control-unit plug term. 15 to the injection valves of cylinders 4, 5 and 6.
- Replace control unit.

#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



**F13**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**F14**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



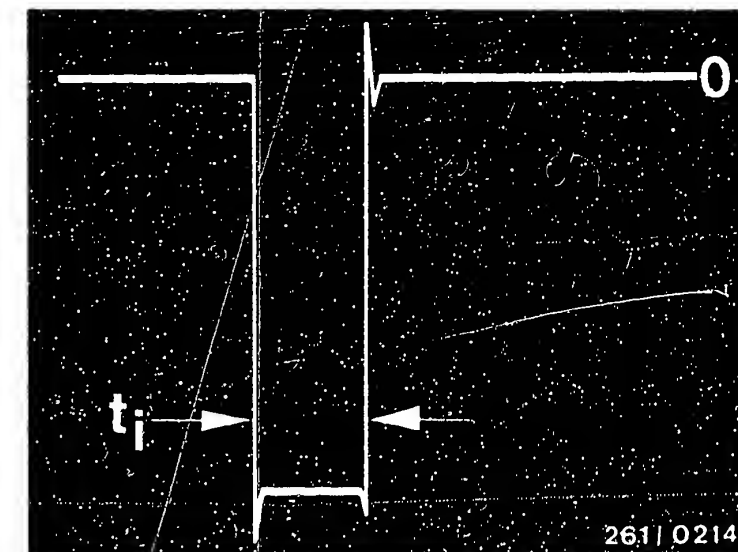
TEST STEP 32			
Operation		Reading	Testing
Program switch position "V"	16	Injection signal at solenoid operated injection valve (see top diagram)	Component: Control unit
Position switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope		yes	Operation: Injection signal at terminal 11 and ground
Measuring range: Special input		no	Malfunction: No signal
Connection: Test wells; red clip to red well, black clip to black well		Continue testing with next test step	
Operation in vehicle: Shift gear to neutral and start			

#### Trouble-shooting:

- Replace control unit.

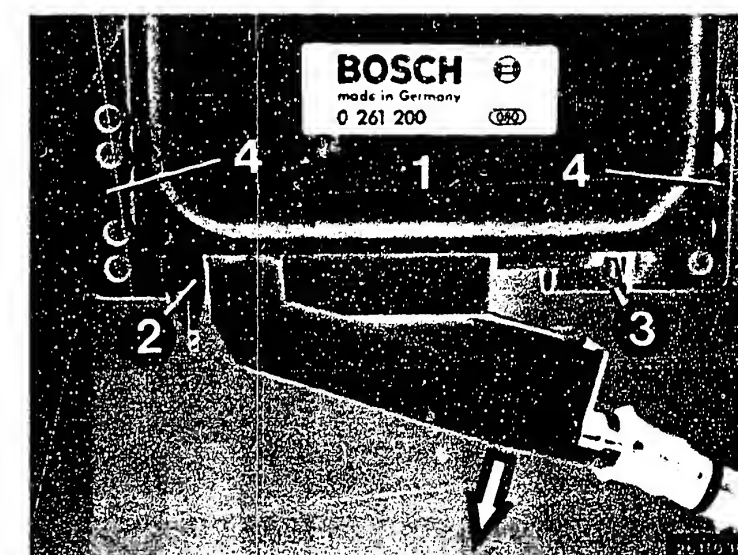
#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



Injection signal  
 $t_i$  = Duration of injection  
 0 = Base line

1=Control unit  
 2=Lug  
 3=Detent  
 4=Mounting holes



**F15**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)

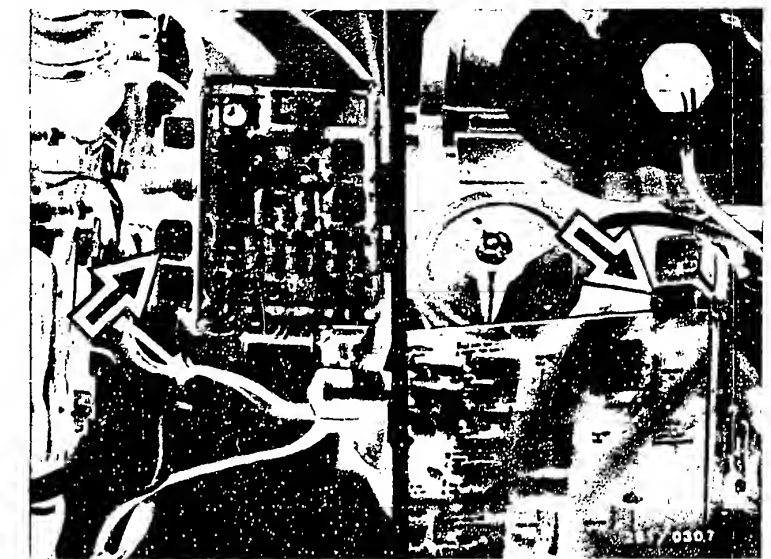


**F16**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 33			
Operation		Reading	Testing
Program switch position "V"	17	10 ... 15 V	<u>Component:</u> Relay 1 (pump relay)
Program switch position "Ω"	15		
Measuring equipment: Voltmeter		yes ↓ Continue testing with next test step	<u>Operation:</u> Voltage at term. 20 to ground  <u>Malfunction:</u> Voltage less than 10 V
Measuring range: 15 V			
Connection: Test sockets; (red = +, black = ground)	V		
Operation in vehicle: Ignition on			
		no ↓	



Arrow=Pump relay (relay 1)  
 (533i,733i similar)  
 Picture a=528e  
 Picture b=633CSi

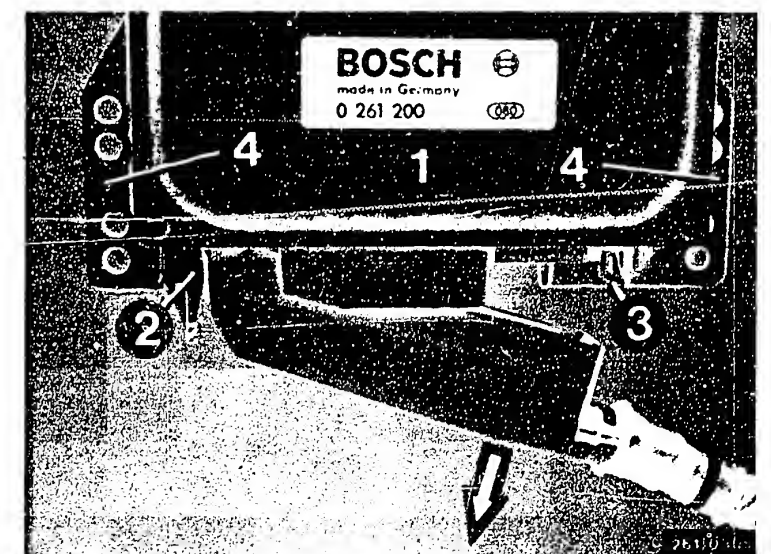
1=Control unit  
 2=Lug  
 3=Detent  
 4=Mounting holes

#### Trouble-shooting:

- Replace relay 1. The position of the relays on the electrics box is not always the same as in the illustrations shown.
- Check lead from control-unit plug term. 20 to relay 1 term. 85.  
Spring contact in control-unit plug term. 20 must not allow itself to be pushed back.
- Replace control unit.

#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



**F17**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

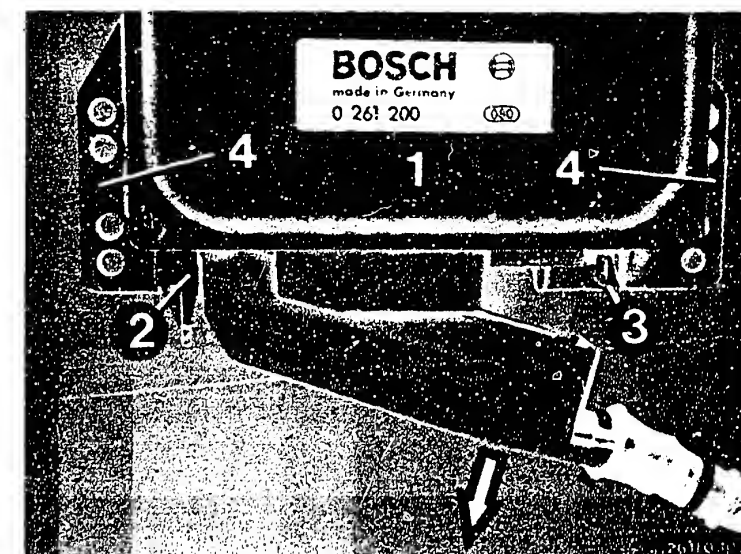


**F18**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 34			
Operation		Reading	Testing
Program switch position "V"	17	max. 4 V	Component: Control unit
Program switch position "Ω"	15		
Measuring equipment: Voltmeter		<div> <div>yes</div> <div>no</div> </div>	<div>Operation:</div> <div>Pump control term. 20 to ground</div> <div>Malfunction:</div> <div>Voltage greater than 4 V</div>
Measuring range:			
15 V			
Connection: Test sockets; (red = +, black = ground)	V		
Operation in vehicle: Shift gear to neutral and start		Continue testing with next test step	



- 1=Control unit
- 2=Lug
- 3=Detent
- 4=Mounting holes

#### Trouble-shooting:

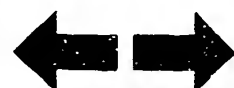
- Replace control unit.

#### Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

**F19**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

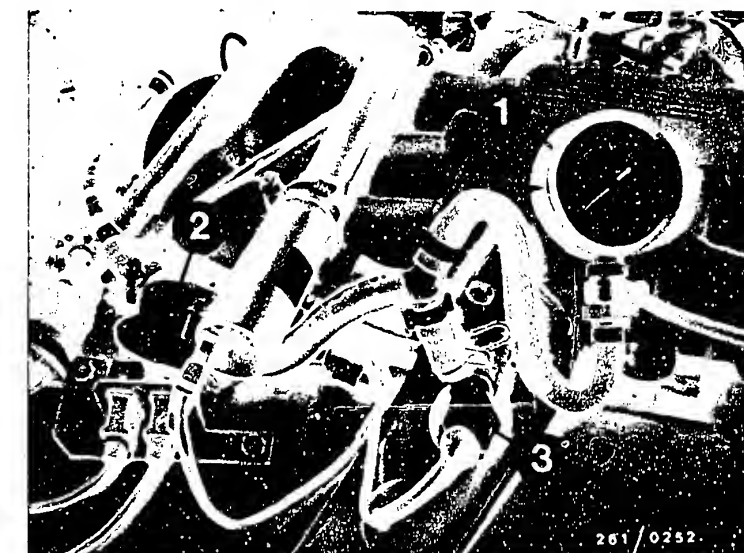


**F20**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 35 Switch off ignition, connect pressure gauge.			
Operation		Reading	Testing
Program switch position "V"	17	2.3 to 2.7 bar	<u>Component:</u> Pump relay, fuel pump, pressure regulator Fuel filter
Program switch position "Ω"	15		
<u>Measuring equipment:</u> Pressure gauge <u>Measuring range:</u> 0 to 6 bar <u>Connection:</u> In fuel delivery line <u>Operation in vehicle:</u> Switch on ignition <u>Button:</u> Press T3		yes ↓ Continue testing with next test step	no ↓ <u>Operation:</u> Fuel pressure  <u>Malfunction:</u> No fuel pressure or pressure not within tolerance



1=Pressure gauge  
 2=Fuel-line-pressure damper in fuel delivery line  
 3=Start valve

Note:

528e:

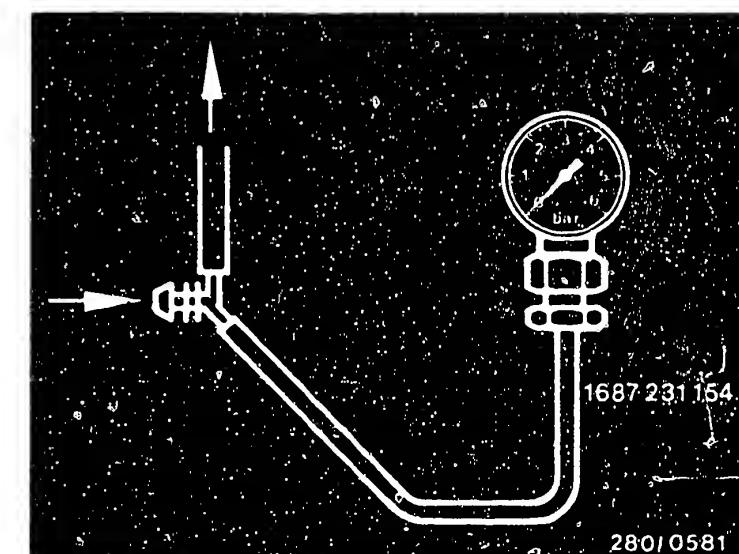
Install pressure gauge (1) in fuel delivery line on start valve (3).

533i,633CSi,733i:

Install pressure gauge in fuel delivery line to fuel-distribution pipe.

Catch escaping gasoline. Danger of fire with hot engine and electric sparks.

Continued on F23/F24



**F21**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



**F22**

Test with universal test adapter  
 BMW 5, 6 and 7 series (USA, Japan)



### TEST STEP 35 - continued

If using pressure tester KDJE-P 100, the valve screw must be closed.

Make sure there are no leaks.

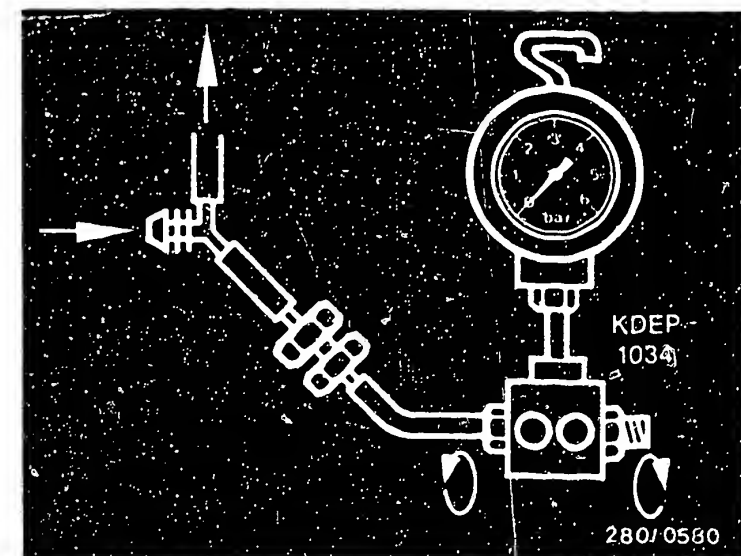
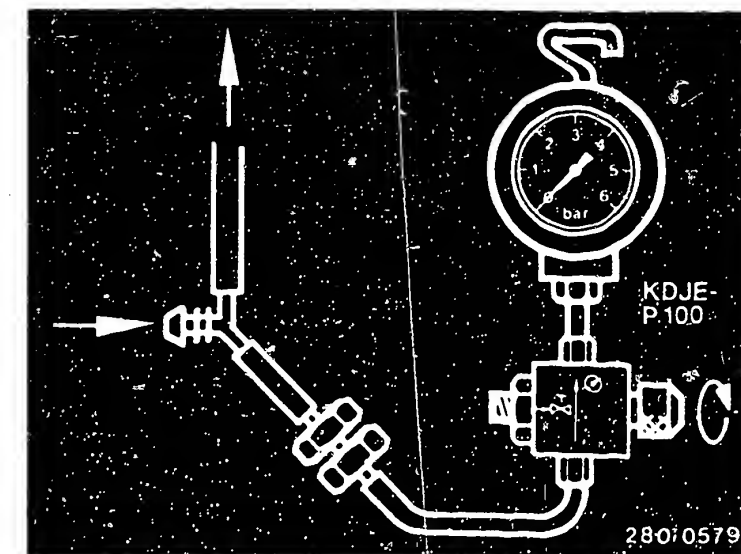
Switch on ignition. Press button T3 to measure the pressure.

### Trouble-shooting - TEST STEP 35

#### 1. Pressure 0 bar, no pumping noises can be heard:

- Check pump fuse.
- Replace relay 1 (pump relay).

Continued on G1/G2



**F23**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**F24**

Test with universal test adapter  
BMW 5, 5 and 7 series (USA, Japan)





### Trouble-shooting - TEST STEP 35 (continued)

- Measure voltage at disconnected pump plug.

No voltage present:

Check lead from fuel pump to relay 2 term. 87b as well as pump ground lead.

- Voltage present:  
Test pressure regulator and fuel pump, as described below under 2.

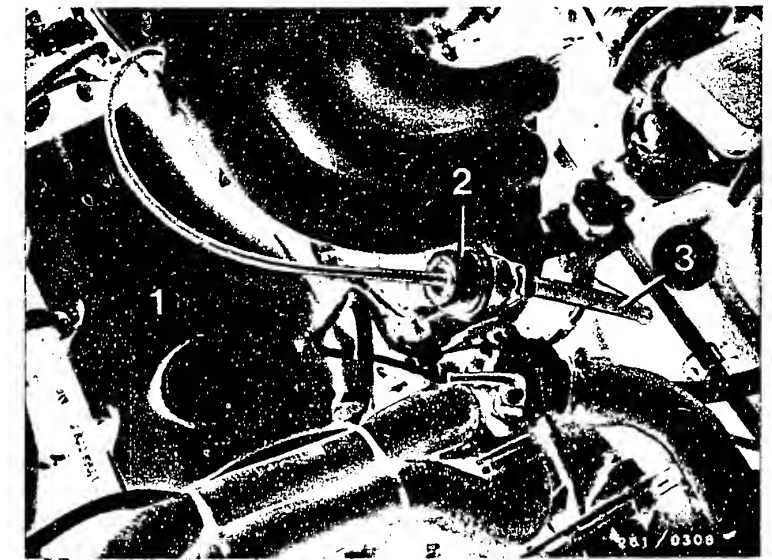
#### 2. Fuel pressure below 2.3 bar, fuel pump operating:

- Fuel pressure too low:  
Slowly pinch off return line with hose clammer. Pressure rises above 4 bar - replace pressure regulator.  
Pressure remains below 4 bar - replace fuel pump.
- Check fuel line and fuel filter for throughflow. Fuel lines pinched?
- Strainer in tank clogged?
- Corrosion in tank?

#### 3. Fuel pressure above 2.7 bar:

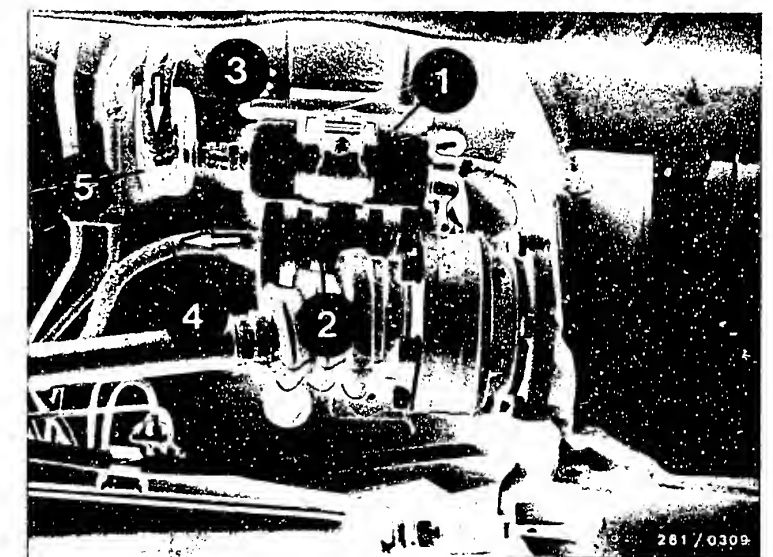
- Fuel return line clogged or pinched.
- Replace pressure regulator.

If the fuel pressure regulator is fastened to the fuel-distribution pipe with an O-ring, the O-ring and the flat ring must be replaced after removing the pressure regulator (use parts set 1 287 010 704).



528e (6 and 7 series similar):  
1=Air hose to intake manifold  
2=Pressure regulator

733i (5 and 6 series similar):  
1=Electric fuel pump  
2=Fuel filter  
3=Fuel intake line  
4=Fuel delivery line  
5=Fuel spinner  
Arrow=Direction of flow



**G1**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**G2**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





**CAUTION:**

The following test steps can only be performed if the engine is running. If engine not running, continue with the trouble-shooting program of your choice.

Detailed trouble-shooting - see C3 - C4

Direct trouble-shooting - see C5 - C10

For further trouble-shooting, test adapter, control unit and pressure gauge remain connected.

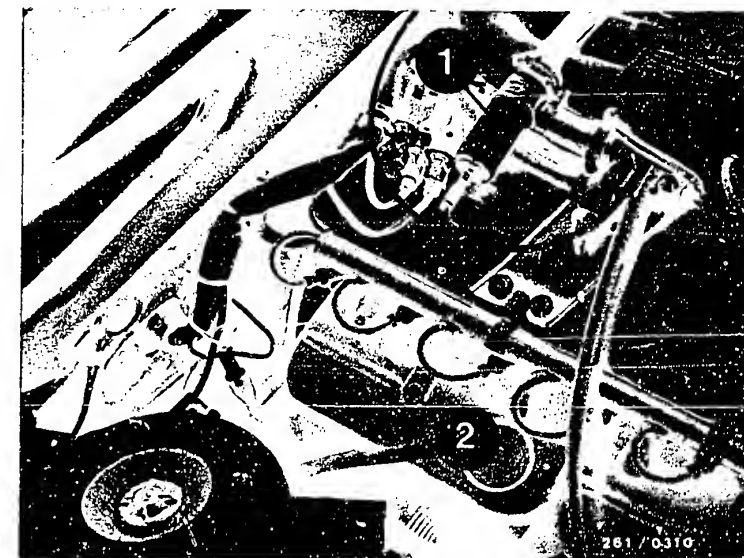
**TEST STEP 36** Connect motortester, diagnostic cable and CO analyzer before catalytic converter.

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch position "V"</u>	17	For testing, switch off electrical devices and disconnect tank vent hose. 1. With engine at operating temperature:  <u>Idle speed:</u> 650 ... 750 min <sup>-1</sup>  <u>CO concentration:</u> 0.2 ... 1.2 vol.%CO  2. Press button T2: Readings must not change.  If reading O.K., continue testing with <u>next test step</u> .	<u>Component:</u> Idle speed control engine, leak test on intake system
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Motortester and CO analyzer			
<u>Measuring range:</u> Engine speed and CO			
<u>Connection:</u> Ignition coil, exhaust			
<u>Operation in vehicle:</u> Let engine run at normal op. temp.			
			<u>Operation:</u> Idle speed and exhaust
			<u>Malfunction:</u> Readings not within tolerance

Trouble-shooting:

- Idle speed not adjustable.  
Idle speed control (VDO) defective.  
If engine hunts, control unit for idle speed control defective.  
Measure winding resistance of actuator.

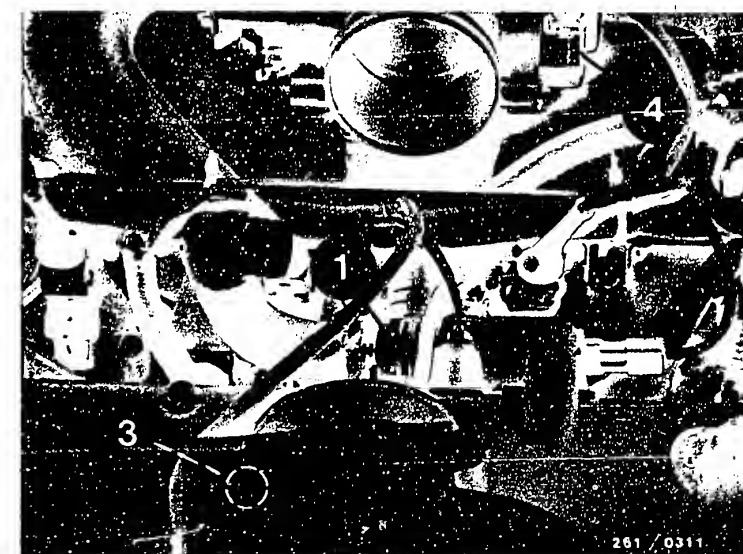
Continued on G 5



528e:

- 1=Actuator for idle speed control
- 2=CO test connection
- 3=Idle-mixture-adjusting screw in air-flow sensor
- 4=Throttle-valve switch

633CSi, 733i:



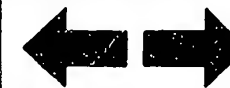
**G3**

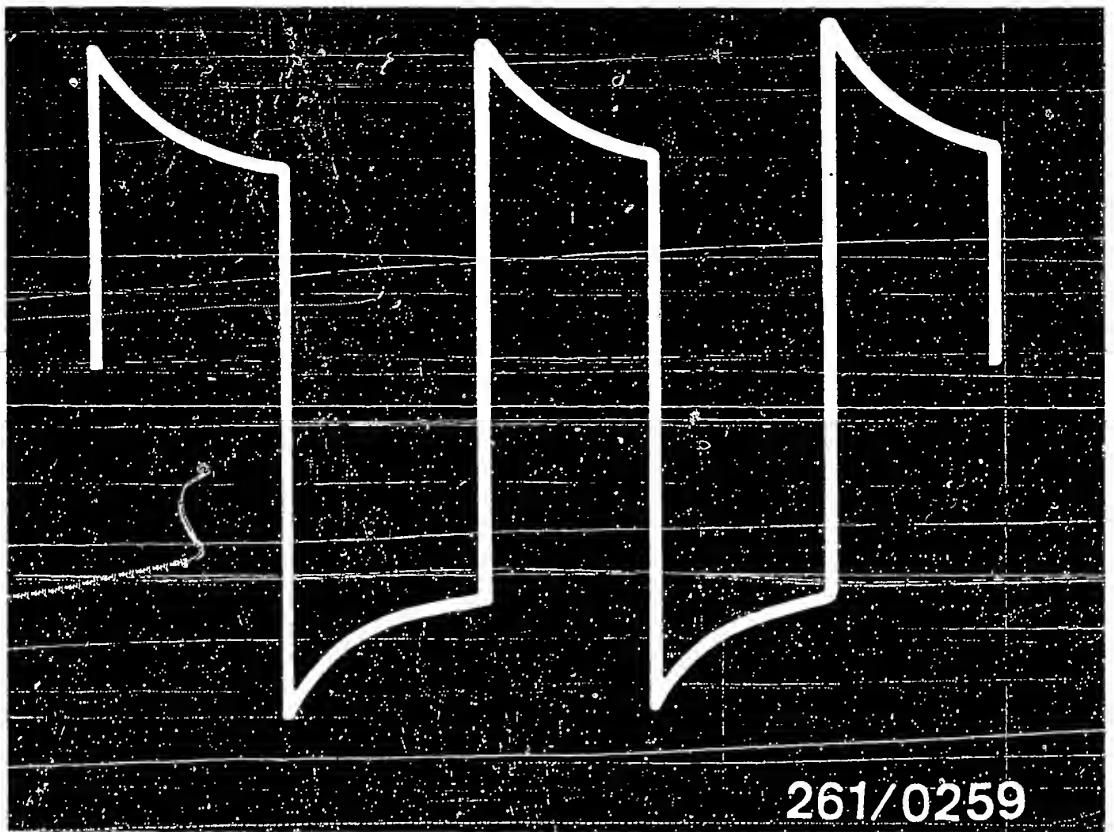
Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**G4**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





Trouble-shooting - TEST STEP 36 (continued)

~~Measure pulses at idle actuator.~~

At idle speed, the above pattern must be visible on the oscilloscope.

If no pulses: Check power supply to control unit for idle speed control or replace control unit for idle speed control.

Further cause of trouble: Actuator mechanically defective.

Continued on G6/G7



### Trouble-shooting - TEST STEP 36 (continued)

- Set exhaust gas with idle-mixture-adjusting screw (hexagon socket head AF 5) in air-flow sensor.  
To do this, remove plug in air-flow sensor using special tool. After adjusting, use new plug.

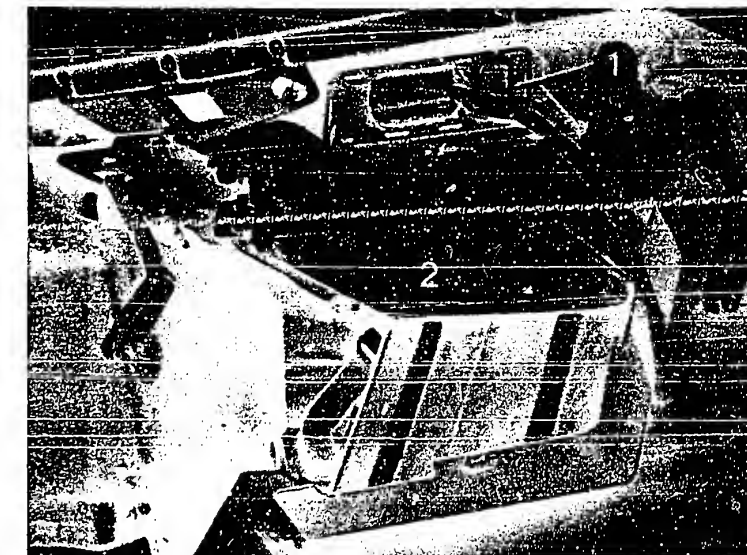
Turning idle-mixture-adjusting screw to the right: CO concentration increases.

Turning idle-mixture-adjusting screw to the left: CO concentration decreases.

Exhaust gas concentration less than 0.2 vol. %CO and not adjustable:  
Check intake side and exhaust system for leaks (unmetered air) by means of pressure test.

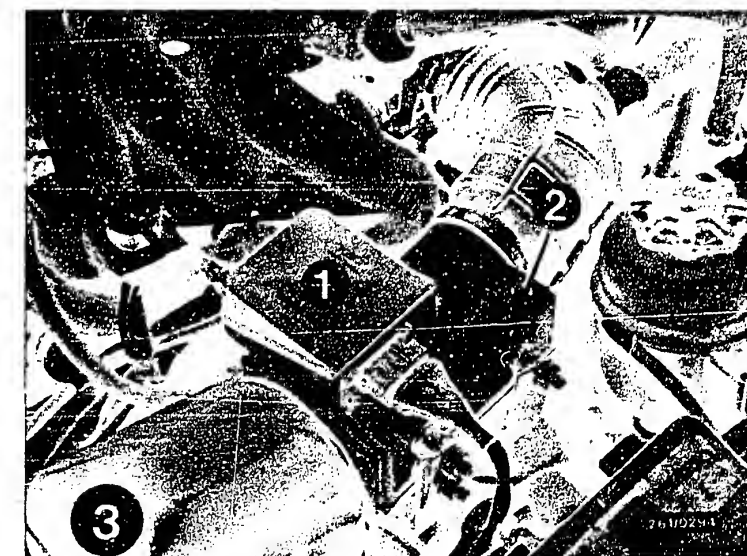
Re 2.

If, after pressing button T2, the readings change, the engine is not yet at normal operating temperature.



528e (6 and 7 series similar):  
1=Control unit for idle speed control  
2=Motronic control unit

528e:  
1=Air-flow sensor  
2=Idle-mixture-adjusting screw  
3=Air filter



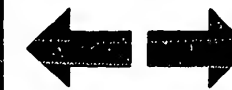
**G6**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**G7**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

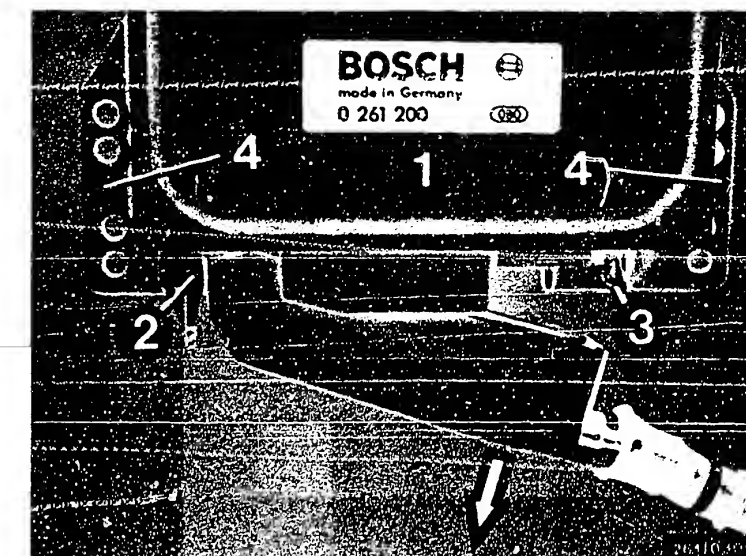


TEST STEP 37		
Operation		Reading
Program switch position "V"	17	1. With engine at op.temp. and at idle speed. 5° ... 15°
Program switch position "Ω"	15	Note: If idle speed fluctuates, spark advance angle also fluctuates.
Measuring equipment: Motortester		2. Press button T6 (full load) and raise engine speed.
Measuring range: Spark advance		528e: At 3000 min <sup>-1</sup> the spark advance is 8°...18° 533i,633CSi,733i: at 4500 min <sup>-1</sup> the spark advance is 15°...25°
Connection: Diagnostic cable		For testing, cool engine with an auxiliary blower since the ignition timing is retardet with increasing intake-air temperature (as of 30°C).
Operation in vehicle: Let engine run at normal op. temp.		

Component:  
Control unit

Operation:  
Spark advance at idle and full load

Malfunction:  
Spark advance not within tolerance



1=Control unit  
2=Lug  
3=Detent  
4=Mounting holes

#### Trouble-shooting:

- 1.: Check idle speed again precisely and repeat test step. Idle speed must be between 650 ... 750 min<sup>-1</sup>.  
Otherwise, different spark advance angles are indicated.
- 2.: Raise engine speed once again to the stated speed and read off spark advance angle again. Switch on auxiliary blower
- Replace control unit.

#### Note:

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

G8

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

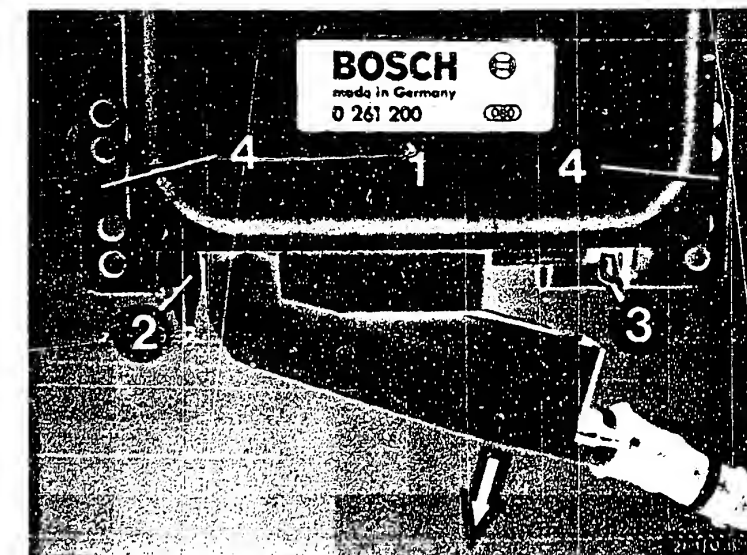


G9

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 38			
Operation		Reading	Testing
Program switch position "V"	17	1. Dwell angle with engine at op. temp. and at idle speed: 8 ... 18° 2. At 3000 min <sup>-1</sup> 22°... 42° <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             yes ↓           </div> <div style="text-align: center;">             no ↓           </div> </div>	Component: Control unit
Program switch position "Ω"	15		
Measuring equipment: Motortester			Operation: Dwell angle
Measuring range: Dwell angle			Malfunction: Dwell angle not within tolerance
Connection: Ignition coil			
Operation in vehicle: Let engine run		Continue testing with next test step	



- 1=Control unit
- 2=Lug
- 3=Detent
- 4=Mounting holes

#### Trouble-shooting:

- Replace control unit.

#### Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

**G 10**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**G 11**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)





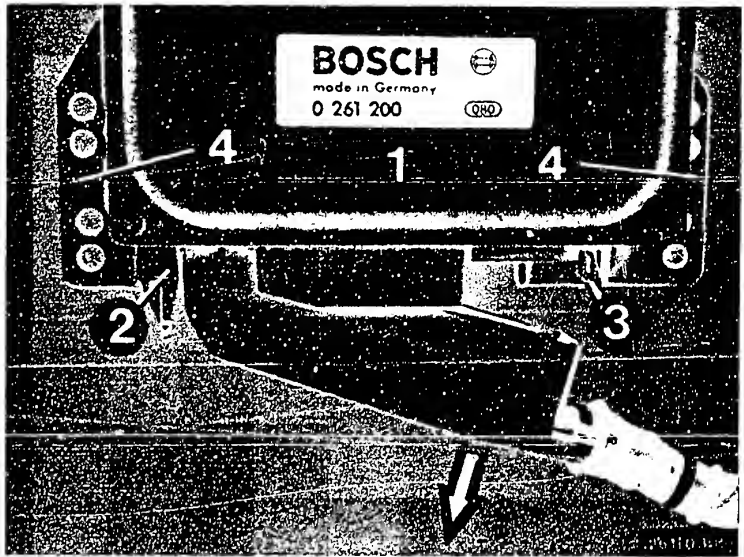
TEST STEP 39		
Operation		Reading
Program switch position "V"	17	Engine at op. temp. Engine speed 2000 min <sup>-1</sup> (keep accelerator position). Press button T5: <u>engine "hunts"</u> i.e. engine speed drops and rises again (injection signals stop and start again at approx. 900...1200 min <sup>-1</sup> ). The engine-speed fluctuations continue as long as button T5 is pressed.
Program switch position "Ω"	15	
Measuring equipment: Motortester		
Measuring range: Engine speed		<div> <div>yes</div> <div>no</div> </div>
Connection: Ignition coil		
Operation in vehicle: Let engine run		
Button: Press T5		Continue testing with next test step

### Testing

Component:  
Control unit

Operation:  
Cutting off of injection pulses (overrun cutoff)

Malfunction:  
No cutting off.



- 1=Control unit
- 2=Lug
- 3=Detent
- 4=Mounting holes

### Trouble-shooting:

- Replace control unit.

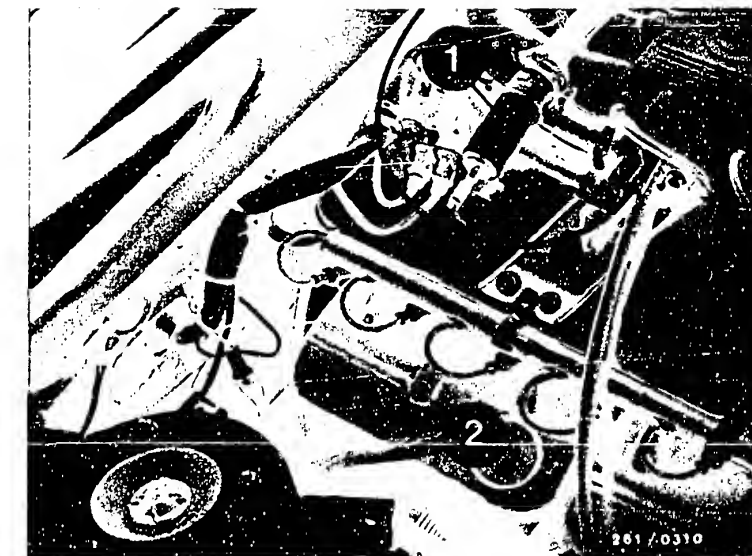
### Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



TEST STEP 40 (Disconnect tank vent hose. Connect CO analyzer before catalytic converter.)

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch position "V"</u>	20	CO rises above 3.5 vol.%	<u>Component:</u> Control unit
<u>Program switch position "Ω"</u>	22	After 10...20s CO concentration drops again to 0.2...1.2 %.	
<u>Measuring equipment:</u> CO analyzer		<div> <div>yes</div> <div>no</div> </div>	<u>Operation:</u> Lambda closed-loop control, upper control limit ("rich" stop), term. 24 to ground
<u>Measuring range:</u> 10 vol.%			<u>Malfunction:</u> CO unchanged
<u>Connection:</u> at test fitting			
<u>Operation in vehicle:</u> Let engine run at op. temp.			



528e: (6 and 7 series similar)  
2=CO test connection

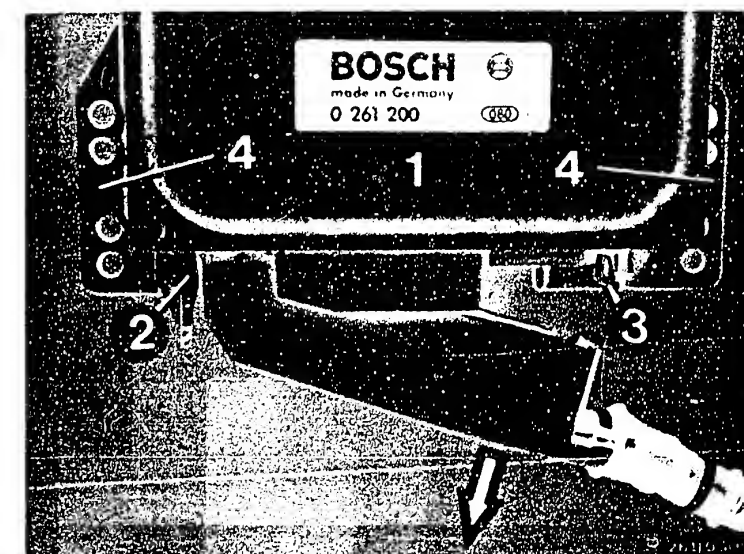
1=Control unit  
2=Lug  
3=Detent  
4=Mounting holes

Trouble-shooting:

- Replace control unit.

Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



**G14**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

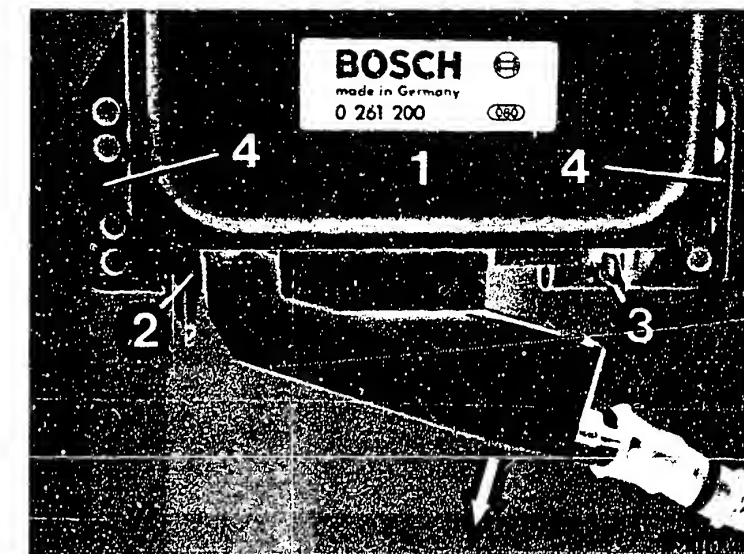


**G15**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 41			
Operation		Reading	Testing
Program switch position "V"	20	CO drops below 0.2 vol. %	Component: Control unit
Program switch position "Ω"	23	Engine runs rough After 10...20s CO concentration drops again to 0.2...1.2 %.	
Measuring equipment: CO analyzer		Operation:	
Measuring range: 2.5 vol. %		yes ↓	Lambda closed-loop control, lower control limit ("lean" stop) term. 24 to + 2V
Connection: at test fitting		Continue testing with next test step	Malfunction: CO concentration unchanged
Operation in vehicle: Let engine run			



1=Control unit  
2=Lug  
3=Detent  
4=Mounting holes

#### Trouble-shooting:

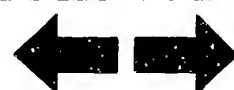
- Replace control unit.

#### Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

**G16**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)

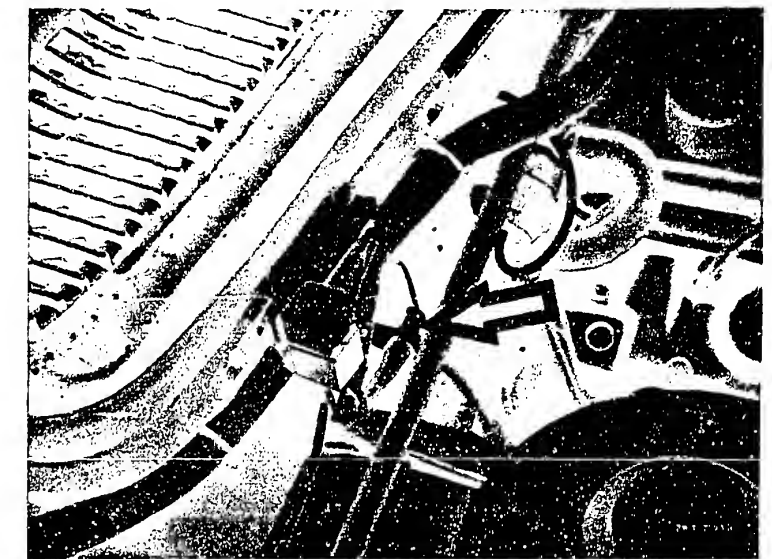


**G17**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



TEST STEP 42			
Operation		Reading	Testing
Program switch position "V"	20	0.2 to 0.6 vol. %	Component: Lambda sensor
Program switch position "Ω"	24	Re-connect tank vent hose after testing is completed.	
Measuring equipment: CO analyzer	<div> <div>yes</div> <div>↓</div> </div> <div>Continue testing with next test step</div>	<div>no</div> <div>↓</div>	Operation: Lambda closed-loop control, term. 24 connected to lambda sensor
Measuring range: 2.5 vol. %			Malfunction: CO concentration not within tolerance
Connection: at test fitting			
Operation in vehicle: Let engine run			



733i (5 and 6 series similar)  
Arrow: Lambda sensor plug connector

633 CSi (5 and 7 series similar)  
Arrow = Lambda sensor with protection plate



#### Trouble-shooting:

##### 1. Replace lambda sensor

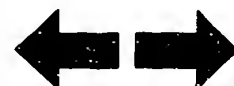
When replacing the sensor, coat its thread with special mounting paste VS 14016 Ft (5 964 080 105). Make sure that only threads are filled and that no paste gets into the slots.

If necessary, before taking apart, clean the plug connector in the sensor lead. When connecting, do not allow any dirt to get into the plug and make sure that the plug latches properly.

##### 2. If 1. without success, replace the control unit.

**G18**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**G19**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



# TEST STEP 43 (if tank vent relay)

Operation		Reading	Testing
Program switch "V" at position:	20	With engine at normal operating temperature up to 30 sec after pressing button:  <u>0 ... 4 V</u>  After 30 sec:  <u>12 ... 15 V</u>	Component: Tank vent relay
Program switch "Ω" at position:	15		
Measuring equipment:			
Voltmeter			Operation: Winding
Measuring range:			
15 V			
Connection: Test sockets: (red =+, black = ground)	V		Malfunction: Voltage
Operation in vehicle:			
Let engine run			
Button:			
Press T6			

## Trouble-shooting:

- Check leads 31 and 83/1 for continuity.
- Tank vent relay defective

Arrow=Tank vent relay

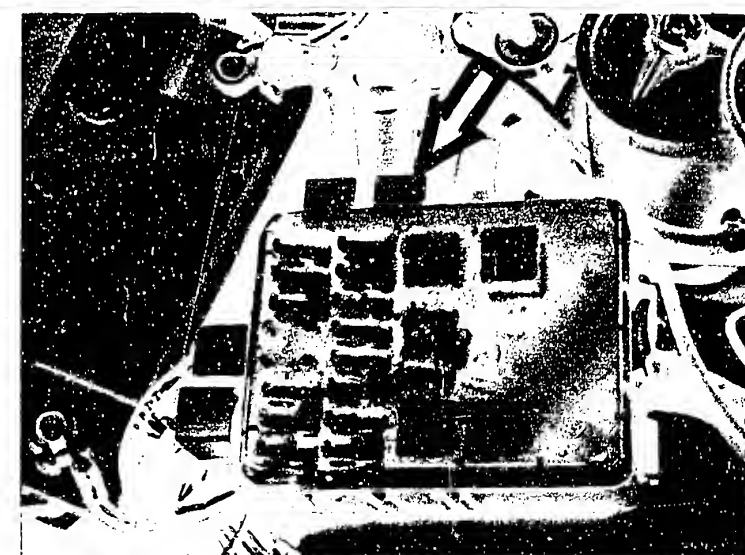
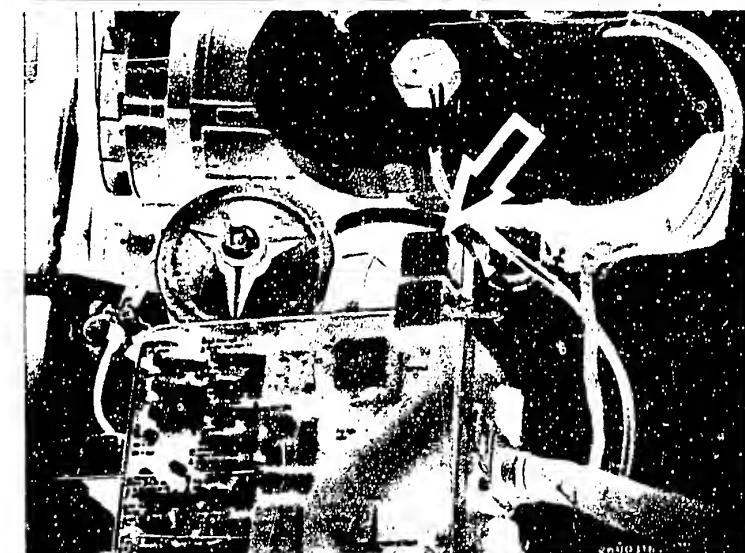
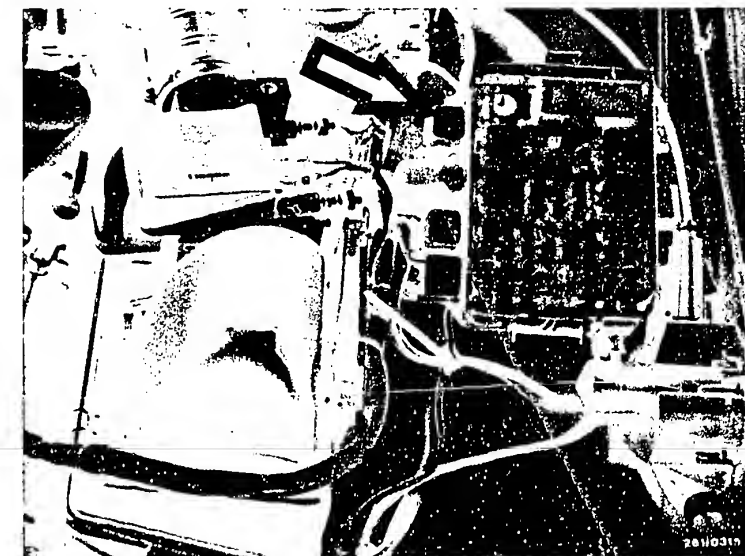
Top picture: 528e

Center picture: 633 CSi (533i similar)

Bottom picture: 733i

## Note:

The position of the relays on the electrics box is not always the same as in the illustrations shown. The reason is that the plug-in bases of the relays can be connected in any desired position on the electrics box.



**G20**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



**G21**

Test with universal test adapter  
BMW 5, 6 and 7 series (USA, Japan)



Testing with the universal test adapter is now completed. If the fault has not been found or if further instructions and information are required on how to remedy the fault, proceed according to the trouble-shooting program of your choice.

- Detailed trouble-shooting - see C3 - C4
- Direct trouble-shooting - see C5 - C10



## STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS ONLY WITH GREAT DIFFICULTY

Trouble-shooting program according to customer complaint

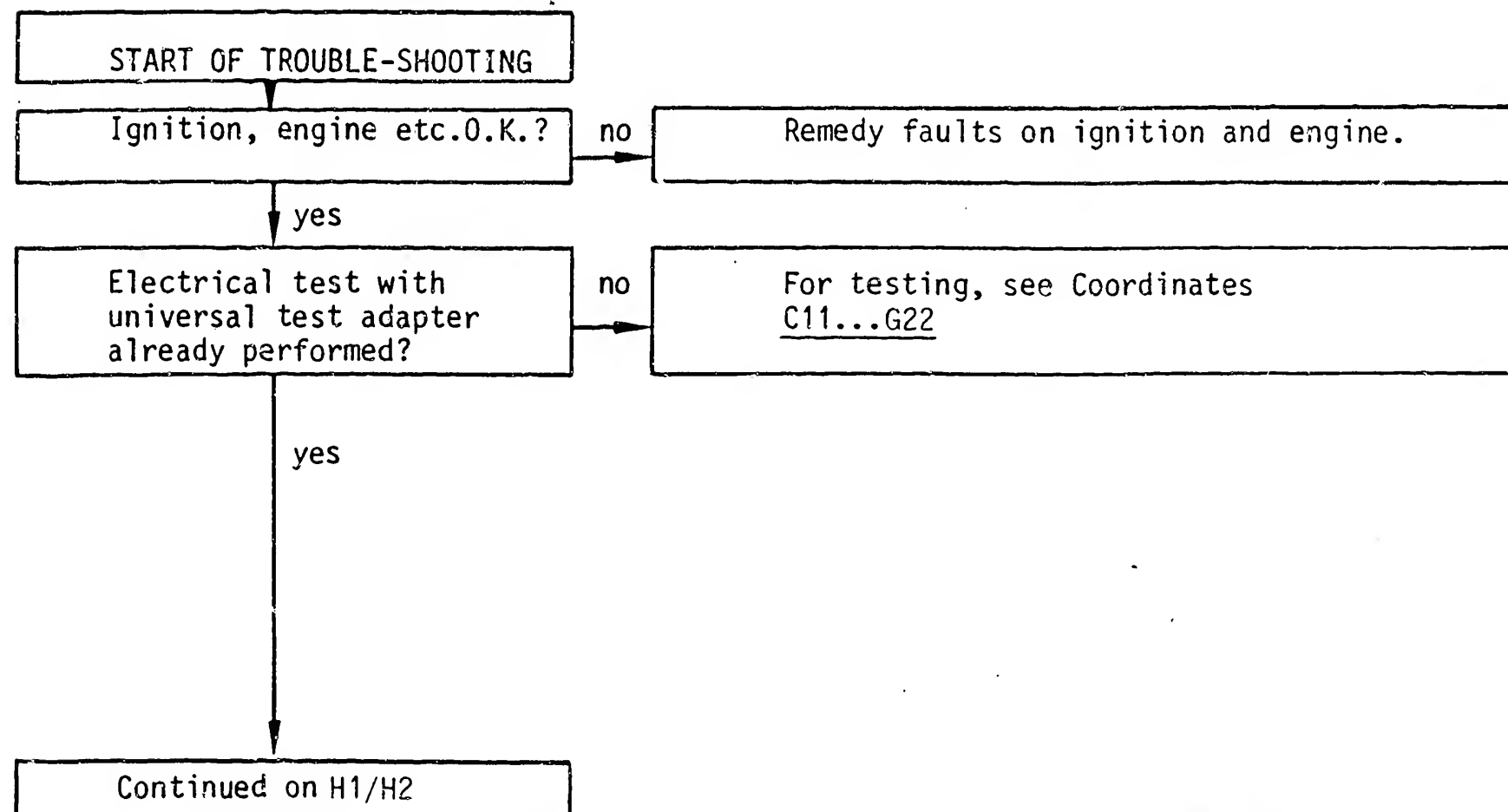
### Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**G23**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



**G24**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)





Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check ignition coil and high-tension part: Distributor cap oil-fouled outside and inside? (Unscrew distributor rotor and check camshaft seal).

Notes:

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

yes

Solenoid-operated injection valves O.K.?

Feel all injection valves by hand while operating starting motor. Can needle movement be felt?

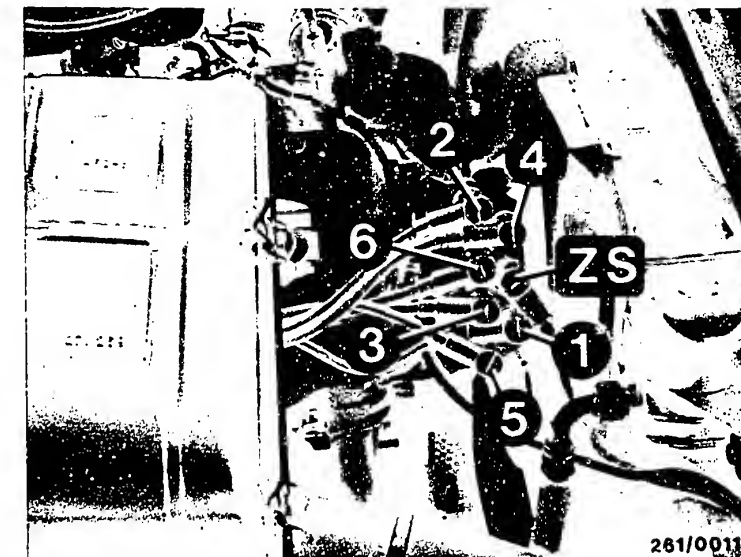
no

Check solenoid-operated injection valve with ohmmeter. Test specification: 2...3  $\Omega$   
If necessary, replace defective solenoid-operated injection valve.

yes

Continued on H7/H8

Continued on H3/H4



High-voltage distributor  
1 to 6=Cylinder numbers  
ZS=High-tension lead to ignition coil

1=Distributor rotor  
Arrows=Fastening screws



H1

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



H2

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

yes

#### Removing the injection valves

Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe upward until the injection valves are out of the holes in the intake manifold. Do not damage nozzle needle or rubber seals.

Check nozzle needle and surrounding area for leaks and deposits. Remove electrical connection. Carefully slide holding clamps out of the groove and pull injection valve out of the fuel-distribution pipe connection.

#### Caution:

Catch escaping fuel. Do not allow to drip onto hot parts of the engine. Fire hazard.

#### Caution:

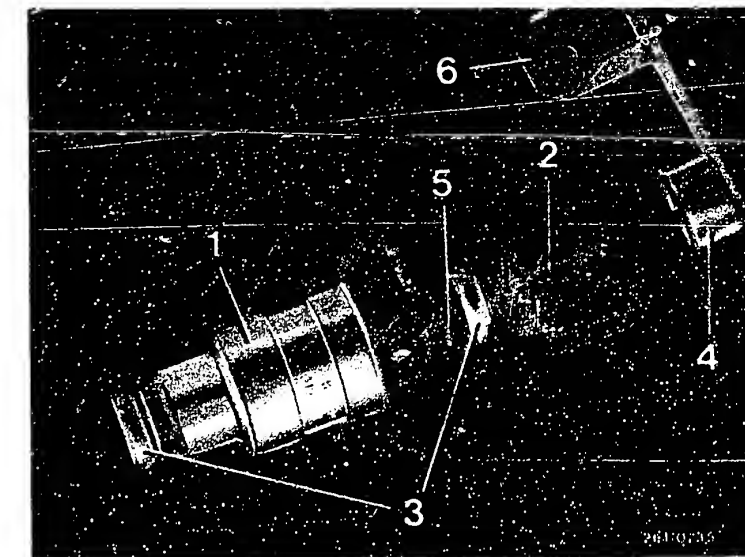
Protective sleeve must not be levered off.

#### Installing the injection valves

Replace O-rings if damaged or swollen. Use parts set 1 287 010 704. Cut through lower O-ring (intake manifold). Warning: Do not damage protective sleeve. Fit new O-ring over protective sleeve and its bead. Do not damage any parts.

Continued on H7/H8

Continued on H5/H6



1=Injection valve

2=Holding clamp

3=Rubber seal (O-ring)

4=Fuel-distribution pipe connection

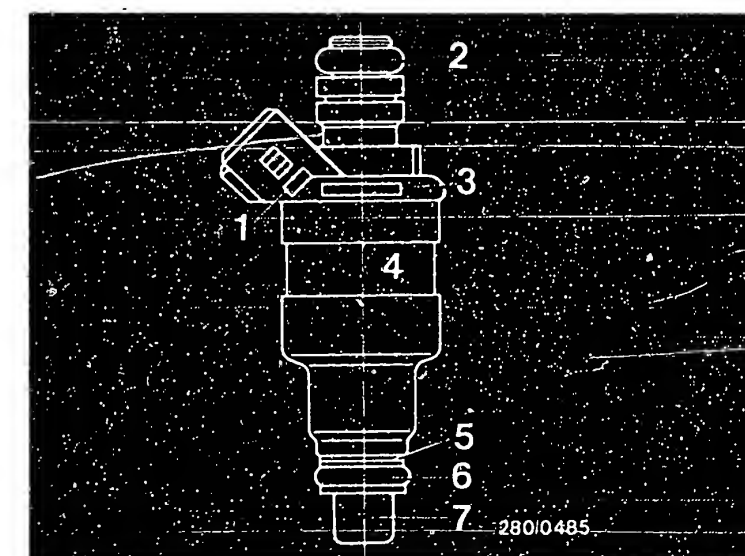
5=Groove

6=Mounting bracket

2=upper O-ring

6=lower O-ring

7=Protective sleeve



**H3**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



**H4**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

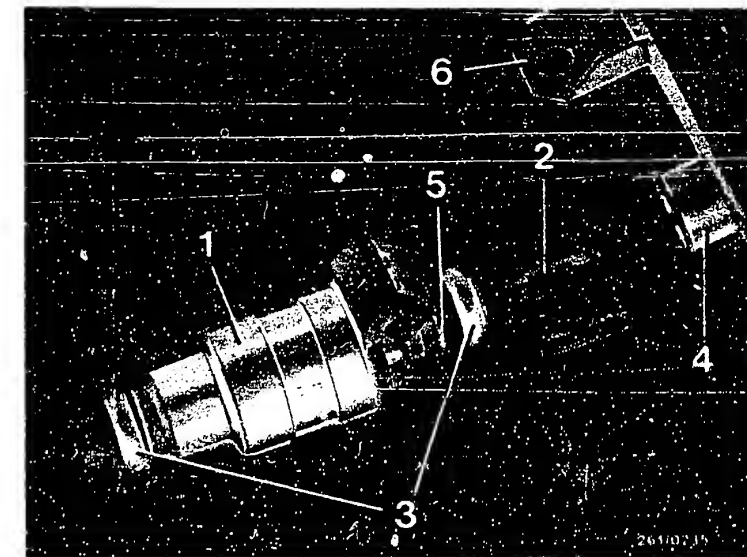
yes

Before installing, check both rubber seals for correct seating. Secure injection valves on fuel-distribution pipe. Simultaneously press all injection valves with the fuel-distribution pipe into their seats. Screw down fuel-distribution pipe. Check all air and fuel hoses for correct seating.

Establish electrical connections.

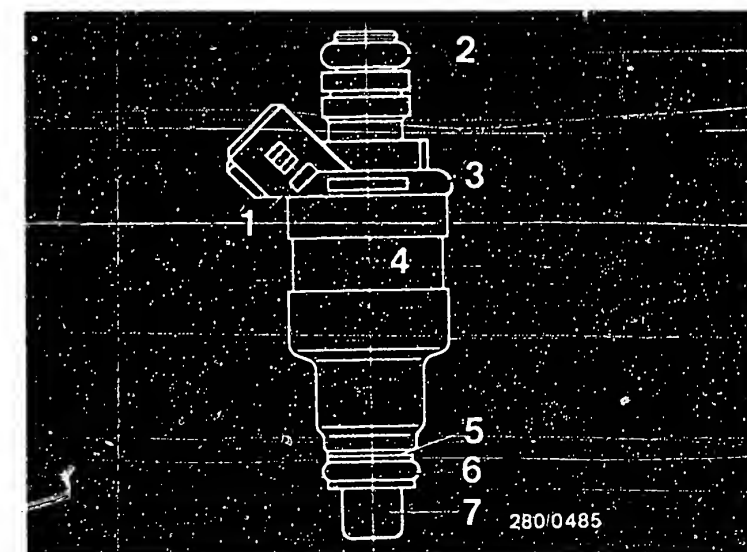
Start engine and check whether any unmetered air is being drawn in.

Continued on H7/H8



- 1=Injection valve
- 2=Holding clamp
- 3=Rubber seal (O-ring)
- 4=Fuel-distribution pipe connection
- 5=Groove
- 6=Mounting bracket

- 2=upper O-ring
- 6=lower O-ring
- 7=Protective sleeve



**H5**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



**H6**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

yes

Idle speed control (non-Bosch product) O.K.?

no

If engine hunts, replace control unit for idle speed control. Measure winding resistance of idle actuator.

Test specification at +20°C:  $9 \dots 10\Omega$

At idle speed, measure pulses at plug of idle actuator (see bottom diagram).

If no pulses present:

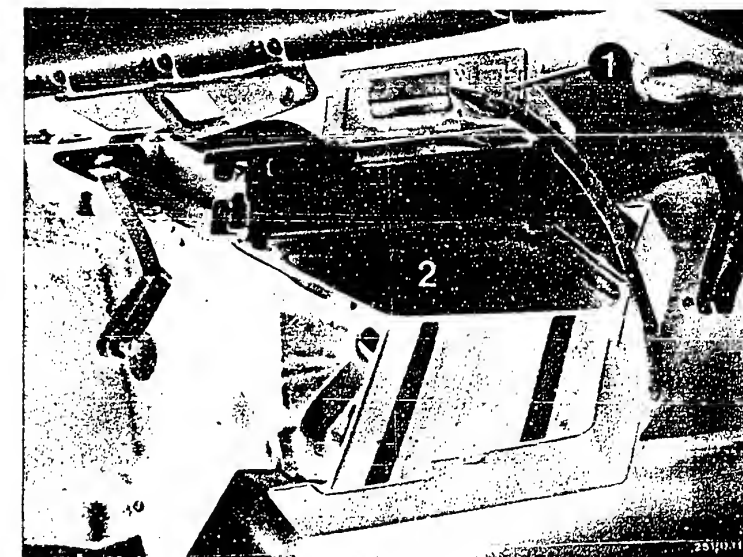
Check power supply to control unit for idle speed control or replace control unit for idle speed control.

Further cause of trouble:

Idle actuator mechanically defective.

yes

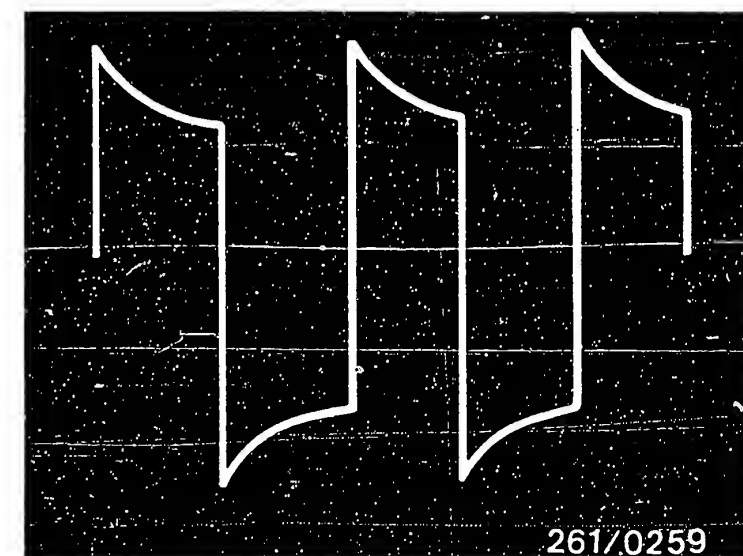
Continued on H9/H10



All models:

1=Control unit for idle speed control  
2=Motronic control unit

Pulses at idle actuator at idle speed



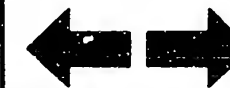
H7

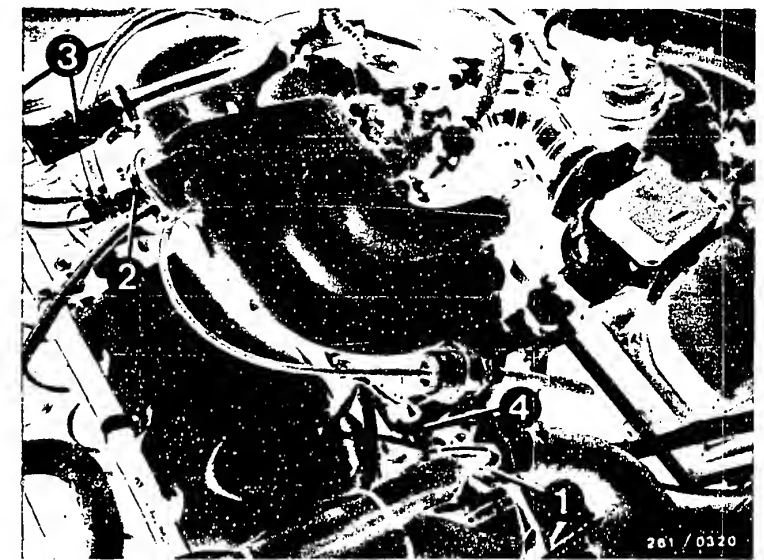
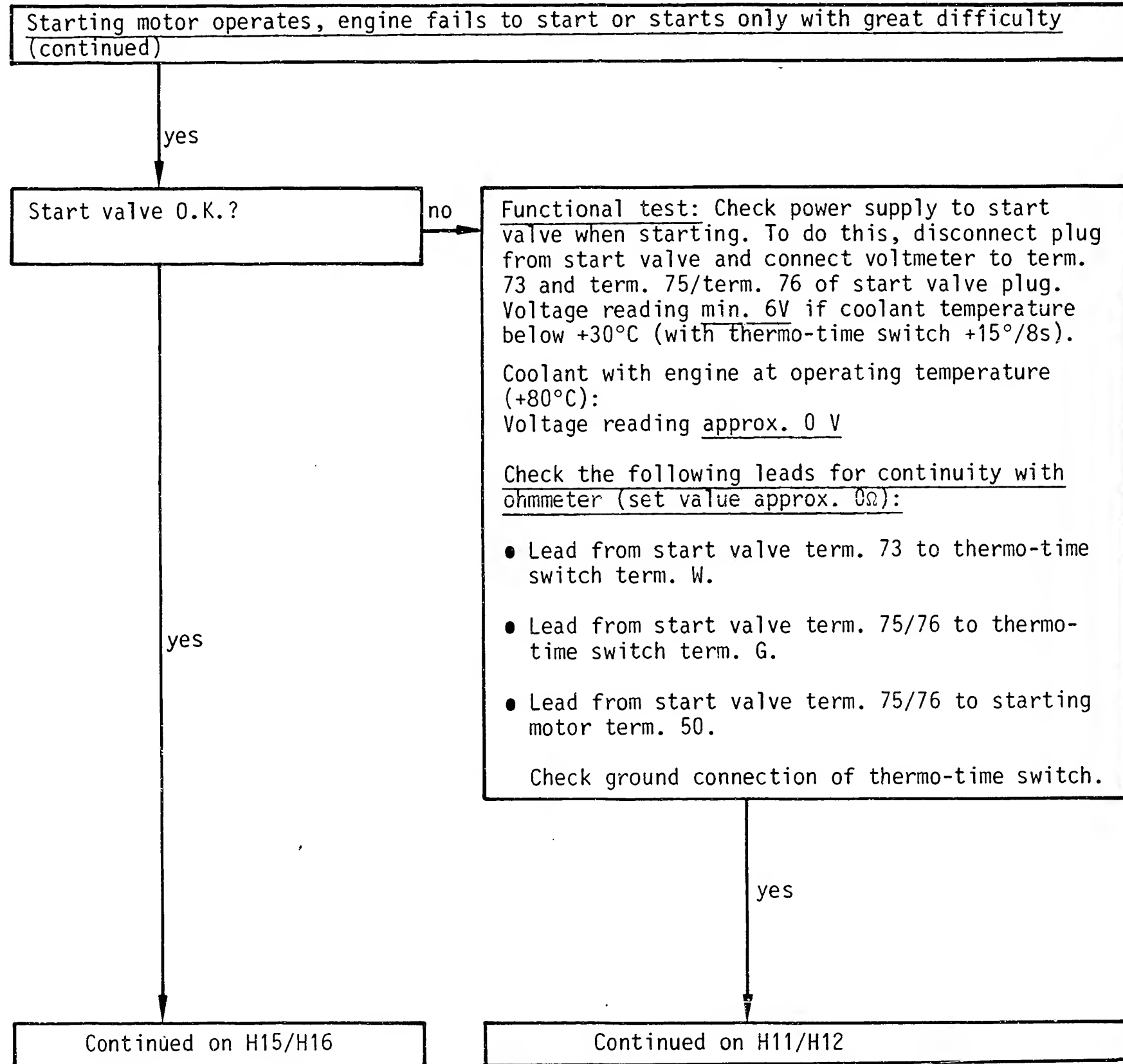
Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



H8

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)

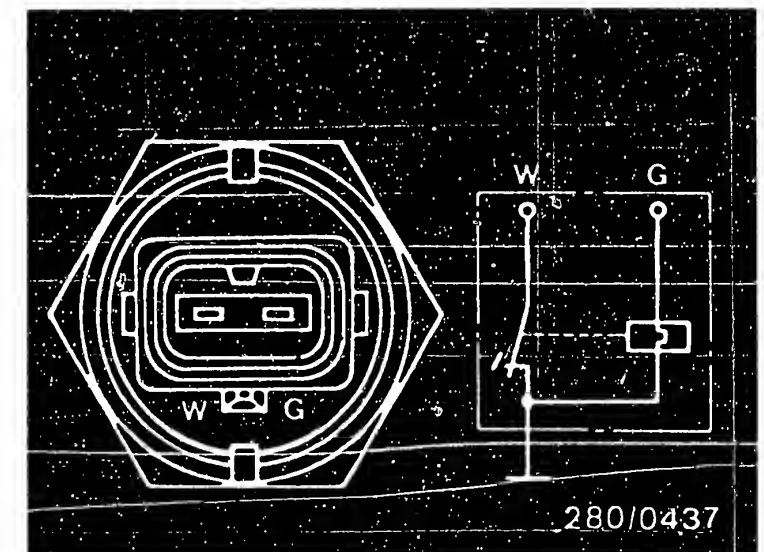




528e:

- 1=Thermo-time switch (brown plug)
- 2=Start valve (blue plug)
- 3=Idle actuator
- 4=Temperature sensor (white plug)

Thermo-time switch



**H9**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



**H10**

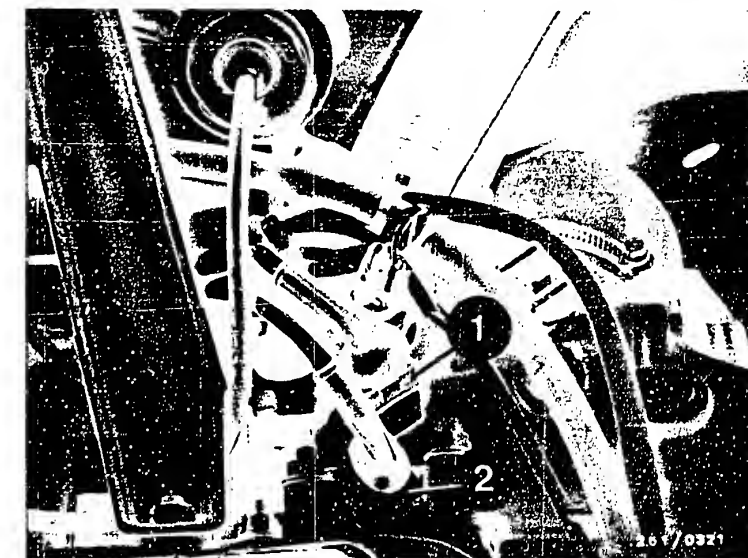
Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Electrical test of start valve:  
Connect ohmmeter to start valve (disconnect plug): Set value approx.  $4\Omega$ :

Mechanical test of start valve:  
Remove start valve from intake manifold and hold in a container. (Caution: Fire hazard). When starting at temperatures below  $+30^{\circ}\text{C}$  the start valve must squirt fuel (max. 8 sec). With the engine at normal operating temperature (approx.  $+80^{\circ}\text{C}$ ) the start valve must not squirt fuel. With the ignition on and the pressure built up the start valve must likewise not squirt fuel.



533i, 633CSi, 733i:  
1=Thermo-time switch (brown plug)  
2=Engine temperature sensor (white plug)

yes

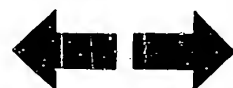
Continued on H15/H16

yes

Continued on H13/H14

**H11**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



**H12**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)





Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Perform squirt test for engine at operating temperature (approx. +80°C) as follows: Disconnect plug from thermo-time switch and ground term. W.

Leak test of start valve:

1. When installed

Pinch off fuel delivery line to start valve.  
If engine then runs, replace start valve.

2. When removed

Remove start valve (Caution: Fire hazard.) Fuel line and electric lead remain connected (place collector vessel under start valve).

Build up fuel pressure:

On universal test adapter, set program switch "V" to position 17.

Switch on ignition and press button T 3.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Continued on H15/H16

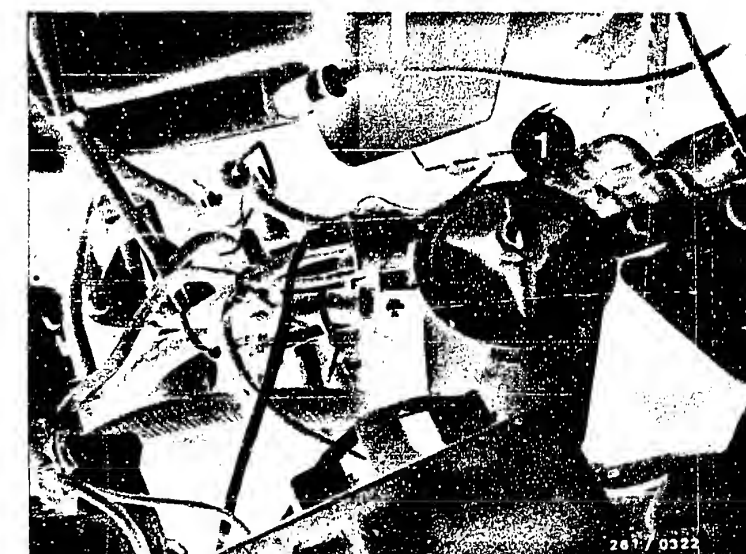


528e:

1=Idle actuator  
2=Start valve

533i, 633CSi, 733i:

1=Start valve (at bottom on intake manifold)



**H13**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



**H14**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

Thermo-time switch O.K.?

no

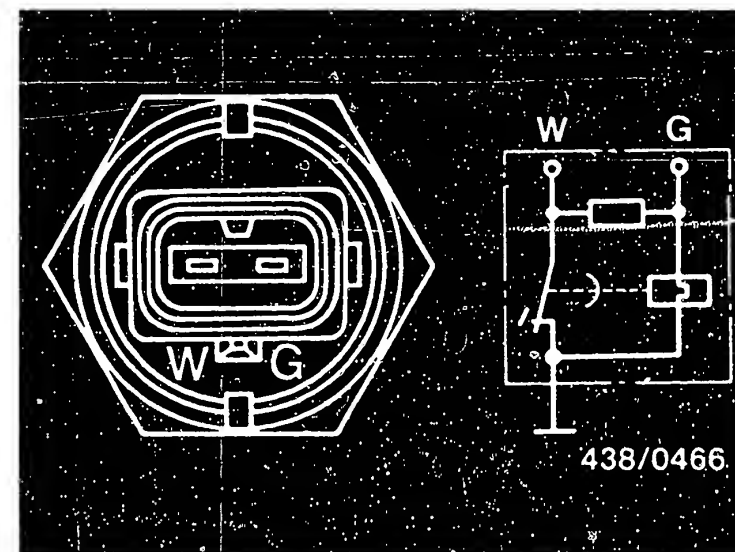
#### Electrical test:

Test thermo-time switch 35°C/8 sec as follows:  
Disconnect plug and measure directly at thermo-time switch with ohmmeter.

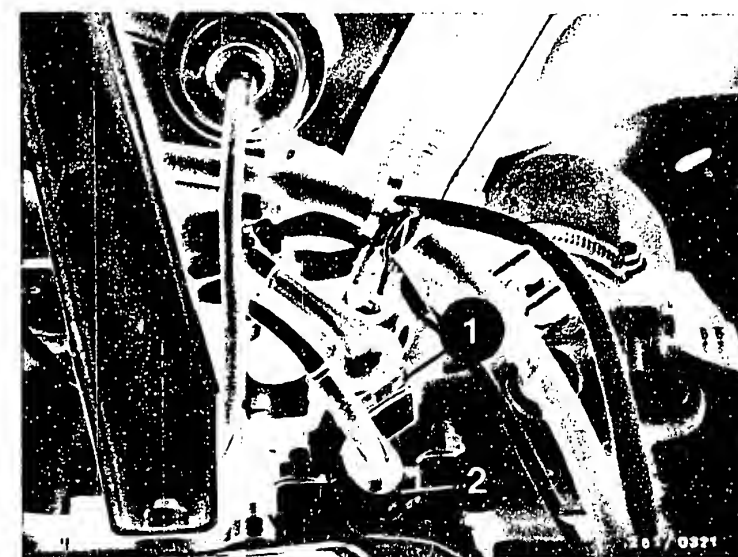
1. Between term. "G" and ground at ambient temperature (approx. +15°...+30°C): 25 ... 40Ω.  
with engine approx. at op. temp. (approx. +80°C): 50 ... 80Ω.
2. Between term. "W" and ground at ambient temperature (approx. +15°...+30°C): 0Ω.  
with engine approx. at op. temp. (approx. +80°C): 100 ... 160Ω.
3. Between term. "G" and "W" at ambient temperature (approx. +15°...+30°C): 25 ... 40Ω.  
with engine approx. at op. temp. (approx. +80°C): 50 ... 80Ω.

yes

Continued on H17/H18



533i, 633CSi, 733 (528e similar)  
1=Thermo-time switch (brown plug)  
2=Engine temperature sensor (white p.)



**H15**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



**H16**

Engine fails to start  
BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

yes

Air-flow sensor mechanically  
O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

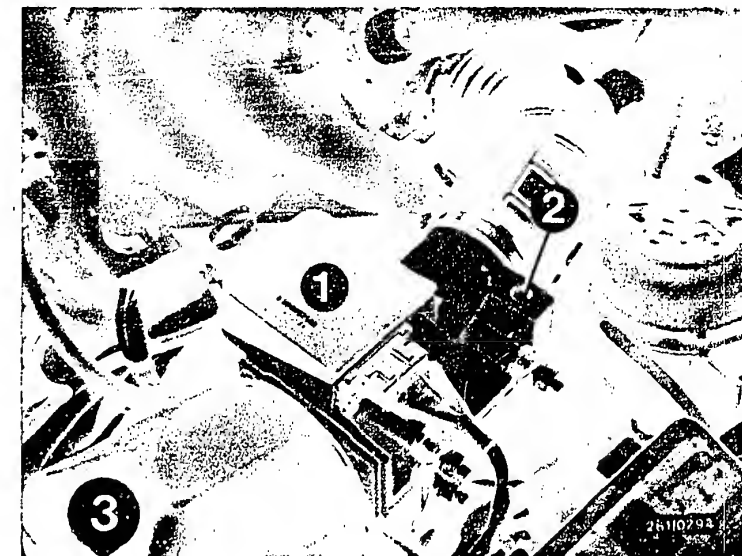
Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on H19/H20



528e:

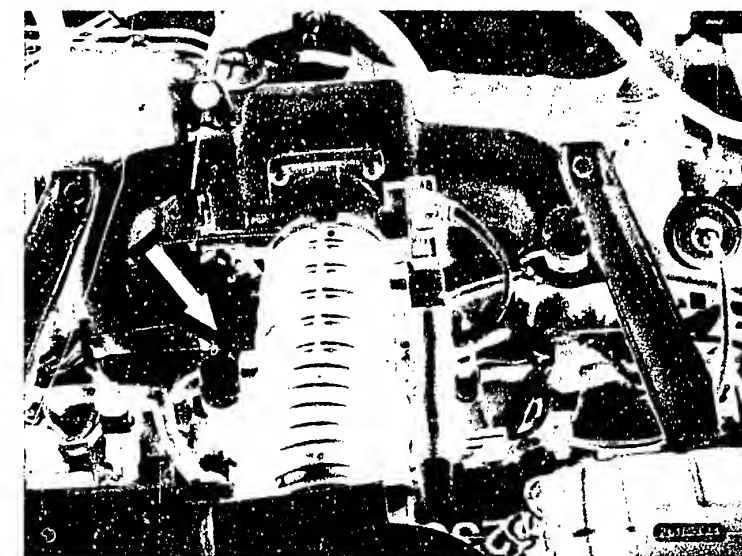
1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter

533i,633CSi,733i:

Arrow=Disconnect hose here for leak test.



**H17**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



**H18**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



Starting motor operates, engine fails to start or starts only with great difficulty  
(continued)

yes

Testing completed for customer complaint

"Starting motor operates, engine fails to start or starts only with great difficulty".

Customer complaint remedied?

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

**H19**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



**H20**

Engine fails to start

BMW 5, 6 and 7 series (USA, Japan)



## ENGINE STARTS BUT THEN DIES

### Trouble-shooting program according to customer complaint

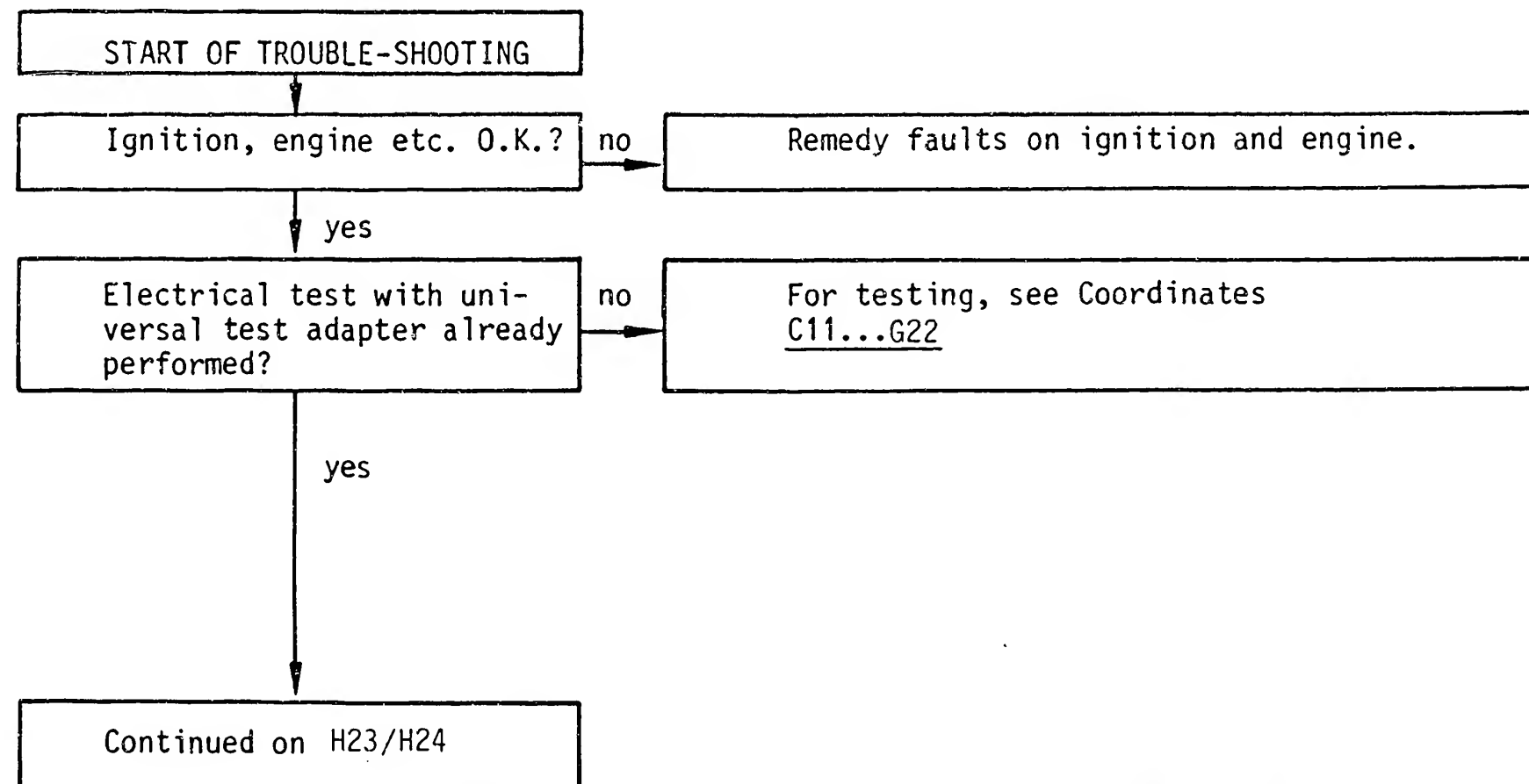
#### Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**H21**

Engine starts but then dies  
BMW 5, 6 and 7 series (USA, Japan)



**H22**

Engine starts but then dies  
BMW 5, 6 and 7 series (USA, Japan)



Engine starts but then dies (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

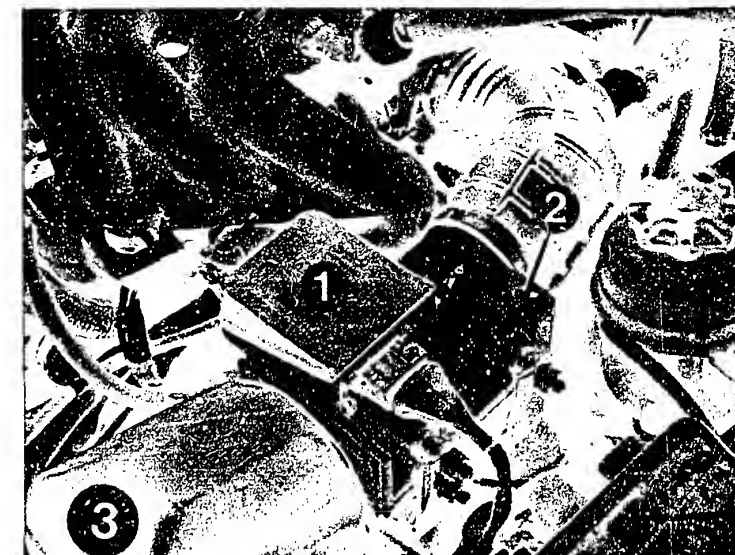
Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by retightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on J1/J2



528e:

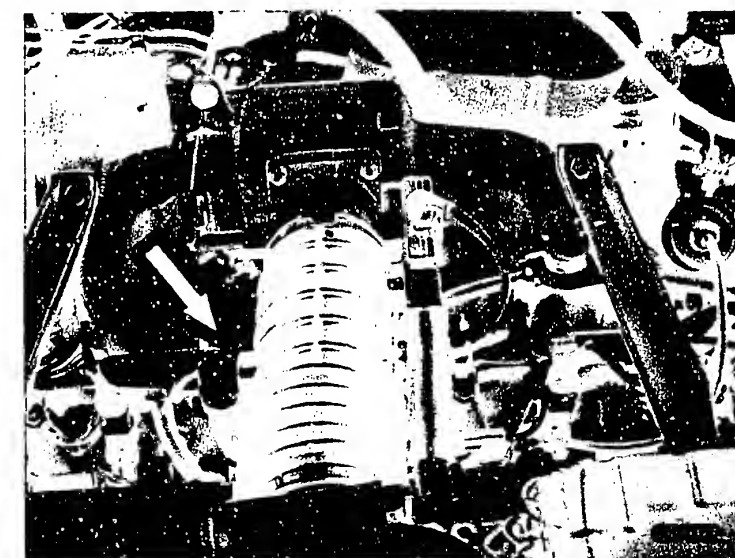
1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter

533i,633CSi,733i:

Arrow=Disconnect hose here for leak test.



**H23**

Engine starts but then dies

BMW 5, 6 and 7 series (USA, Japan)



**H24**

Engine starts but then dies

BMW 5, 6 and 7 series (USA, Japan)





Engine starts but then dies (continued)

yes

Idle speed control (non-Bosch product) O.K.?

no

If engine hunts, replace control unit for idle speed control. Measure winding resistance of idle actuator.

Test specification at +20°C:  $9 \dots 10\Omega$

At idle speed, measure pulses at plug of idle actuator (see bottom diagram).

If no pulses present:

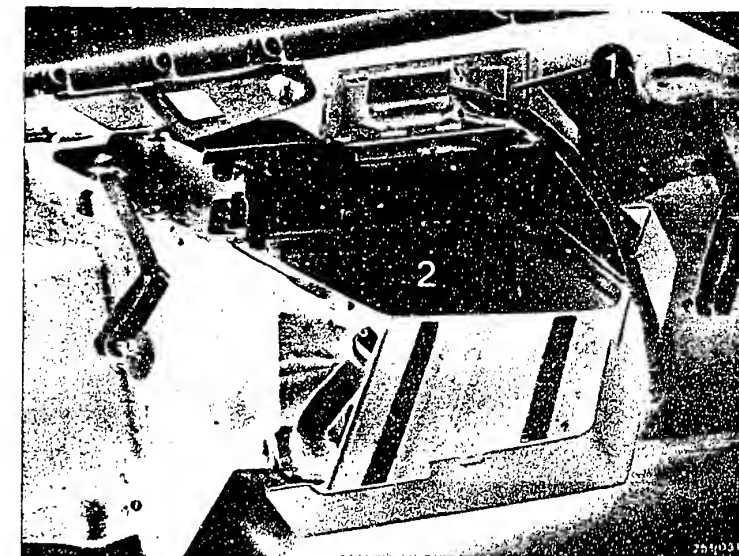
Check power supply to control unit for idle speed control or replace control unit for idle speed control.

Further cause of trouble:

Idle actuator mechanically defective.

yes

Continued on J3/J4

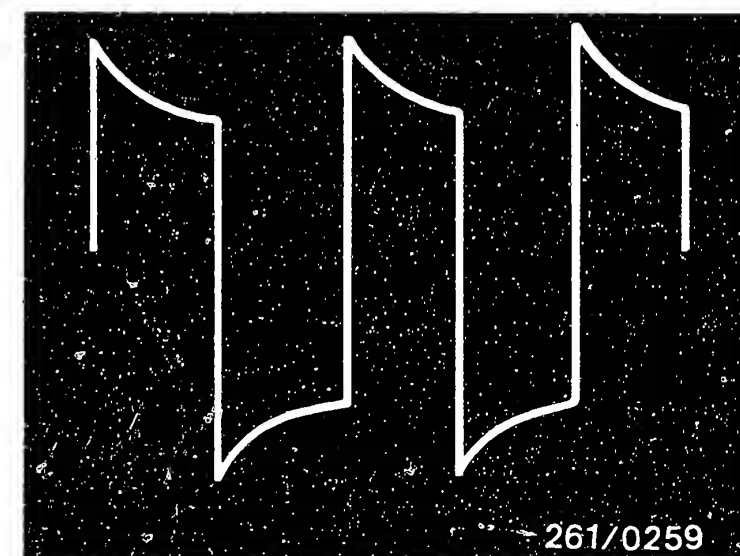


All models:

1=Control unit for idle speed control

2=Motronic control unit

Pulses at idle actuator at idle speed



J1

Engine starts but then dies

BMW 5, 6 and 7 series (USA, Japan)



J2

Engine starts but then dies

BMW 5, 6 and 7 series (USA, Japan)



Engine starts but then dies (continued)

Start valve O.K.?  
(Leak test)

no

1. When installed

Pinch off fuel delivery line to start valve. If CO concentration then O.K., replace start valve.

2. When removed

Remove start valve (Caution: Fire hazard.) Fuel line and electric lead remain connected (place collector vessel under start valve).

Build up fuel pressure:

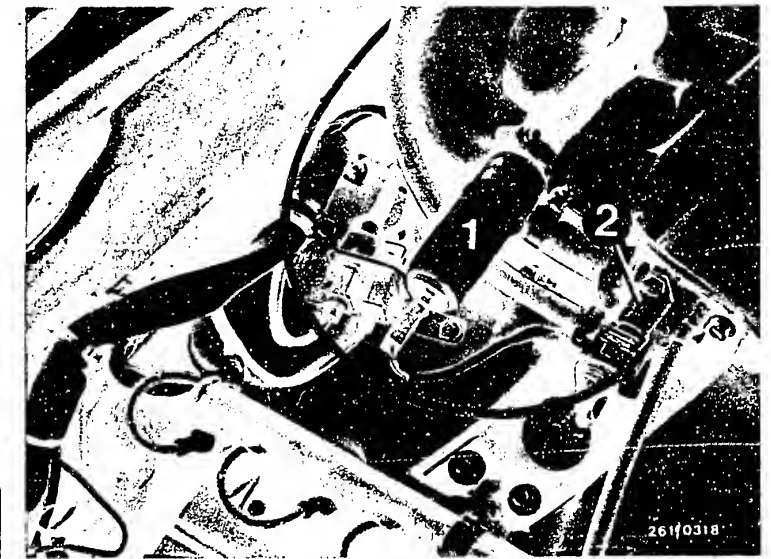
On universal test adapter, set program switch "V" to position 17.

Switch on ignition and press button T 3.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Continued on J5/J6



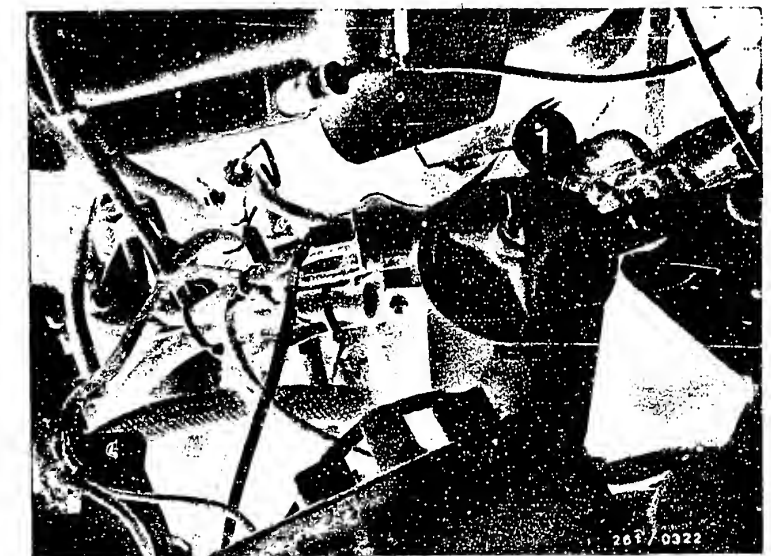
528e:

1=Idle actuator

2=Start valve

533i, 633CSi, 733i:

1=Start valve (at bottom on intake manifold)



**J3**

Engine starts but then dies  
BMW 5, 6 and 7 series (USA, Japan)



**J4**

Engine starts but then dies  
BMW 5, 6 and 7 series (USA, Japan)



Engine starts but then dies (continued)

Thermo-time switch O.K.?

no

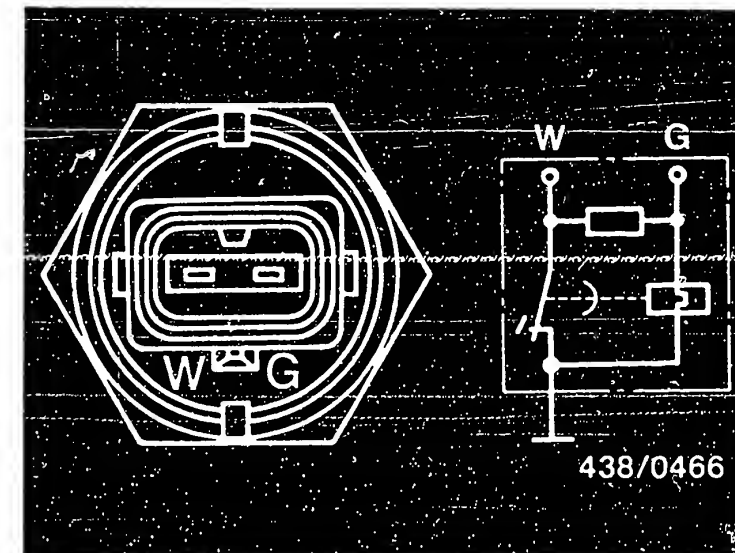
Electrical test:

Test thermo-time switch 35°C/8 sec as follows:  
Disconnect plug and measure directly at thermo-time switch with ohmmeter.

1. Between term. "G" and ground at ambient temperature (approx. +15°...+30°C): 25 ... 40Ω.  
with engine approx. at op. temp. (approx. +80°C): 50 ... 80Ω.
2. Between term. "W" and ground at ambient temperature (approx. +15°...+30°C): 0Ω.  
with engine approx. at op. temp. (approx. +80°C): 100 ... 160Ω.
3. Between term. "G" and "W" at ambient temperature (approx. +15°...+30°C): 25 ... 40Ω.  
with engine approx. at op. temp. (approx. +80°C): 50 ... 80Ω.

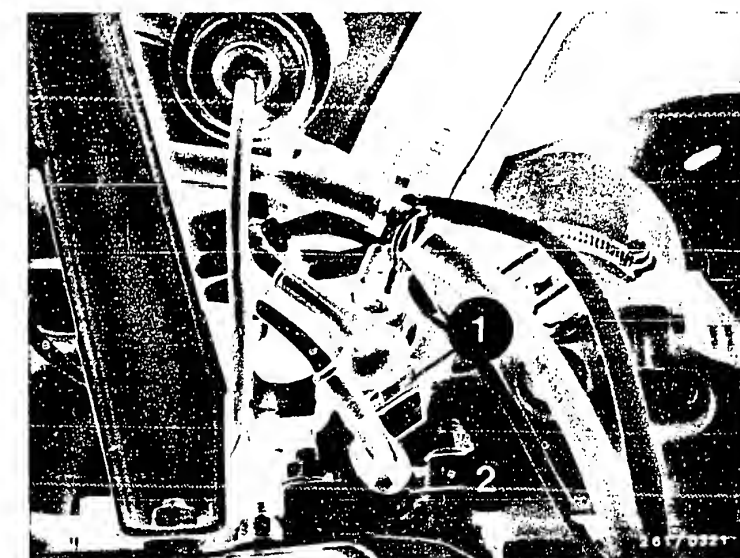
yes

Continued on J7/J8



Thermo-time switch

533i, 633CSi, 733 (528e similar)  
1=Thermo-time switch (brown plug)  
2=Engine temperature sensor (white p.)



**J5**

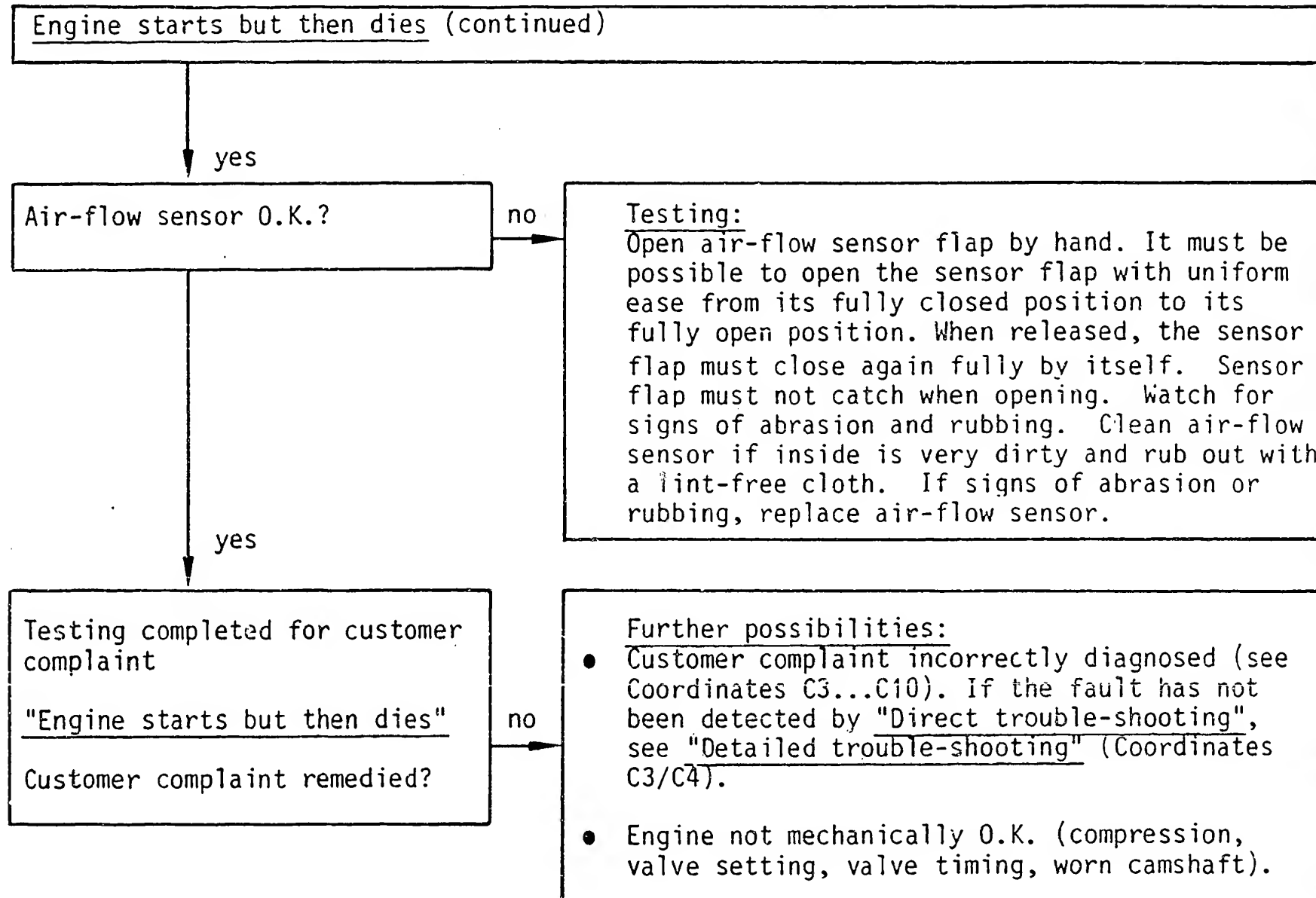
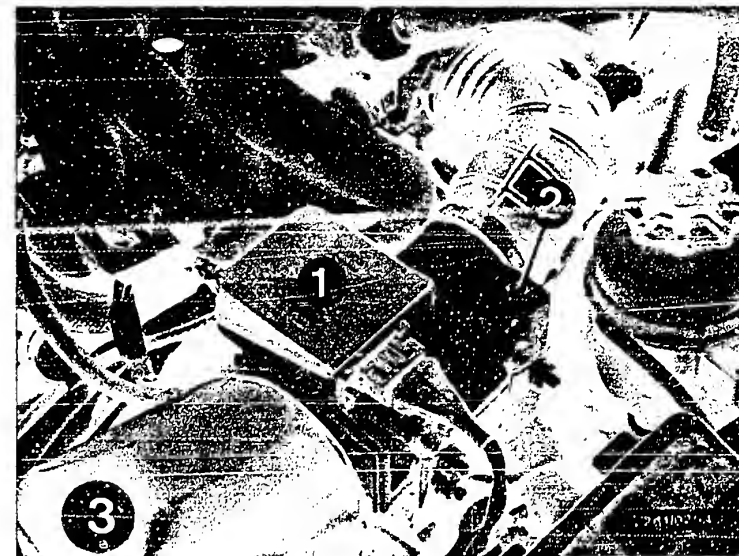
Engine starts but then dies  
BMW 5, 6 and 7 series (USA, Japan)



**J6**

Engine starts but then dies  
BMW 5, 6 and 7 series (USA, Japan)





## ROUGH IDLE/INCORRECT IDLE SPEED

Trouble-shooting program according to customer complaint

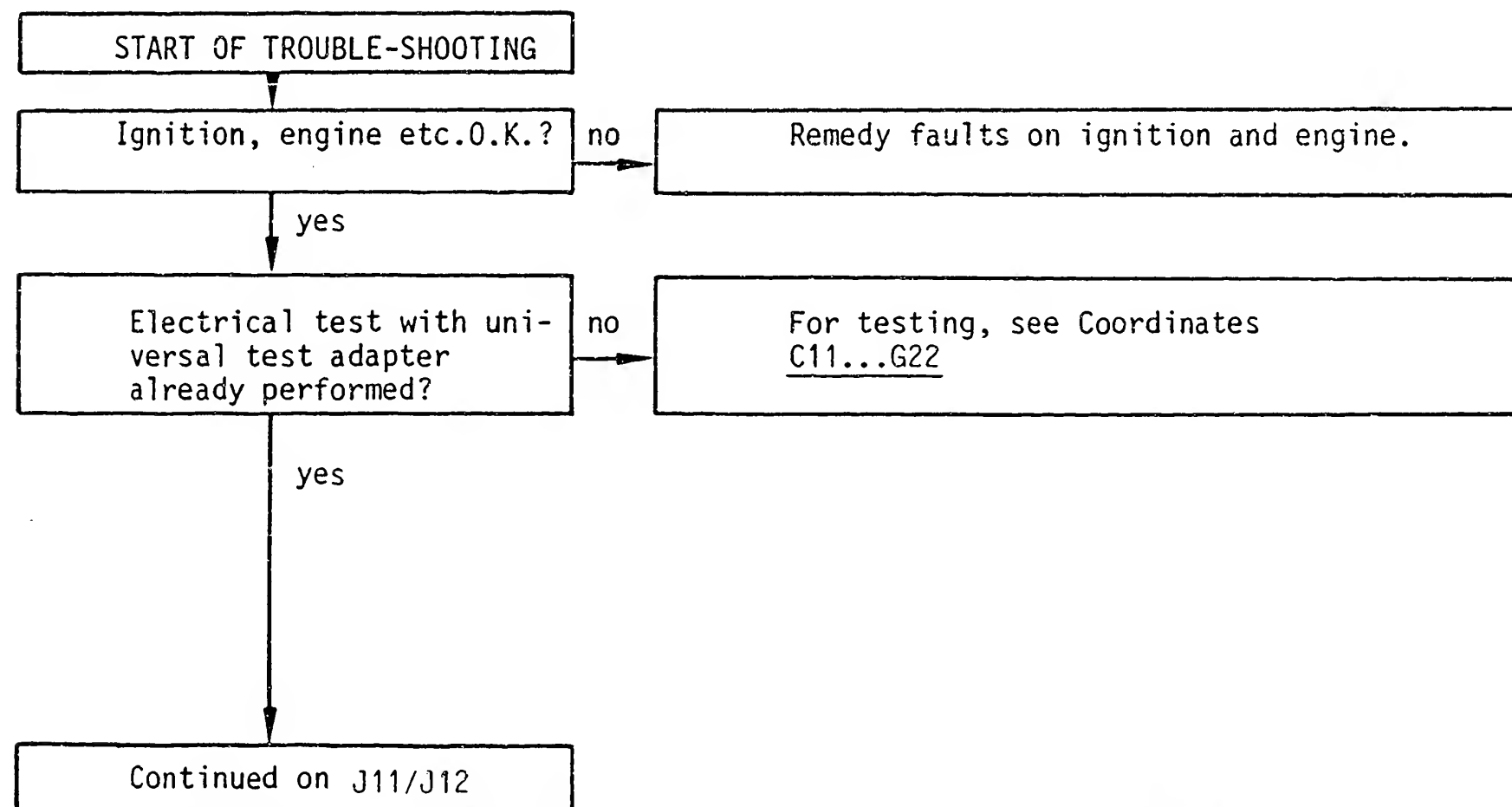
### Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**J9**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



**J10**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



# Rough idle/incorrect idle speed (continued)

yes

Check secondary pattern of all cylinders.  
Secondary pattern O.K.?

no

Check ignition coil and high-tension part:  
Distributor cap oil-fouled outside and inside?  
(Unscrew distributor rotor and check camshaft seal).

## Notes:

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. 0  $\Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

## Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

yes

Air-flow sensor O.K.?

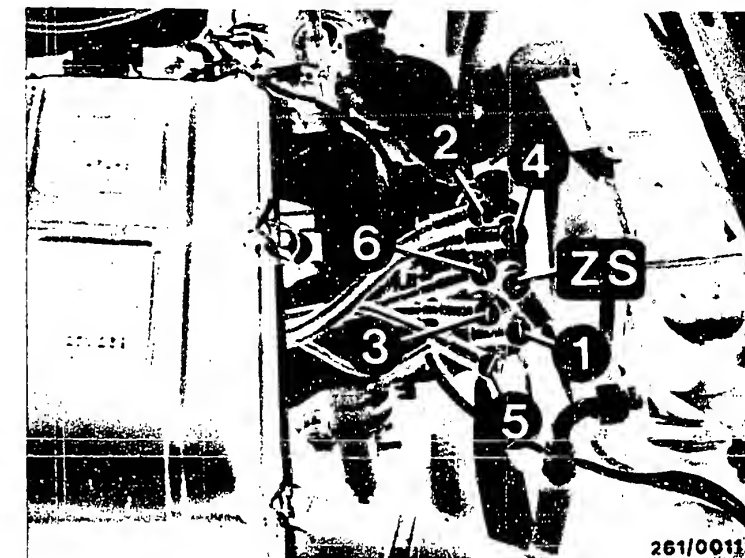
no

## Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Continued on J13/J14



High-voltage distributor

1 to 6=Cylinder numbers

ZS=High-tension lead to ignition coil

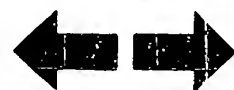
1=Distributor rotor  
Arrows=Fastening screws



J11

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



J12

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)





Rough idle/incorrect idle speed (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

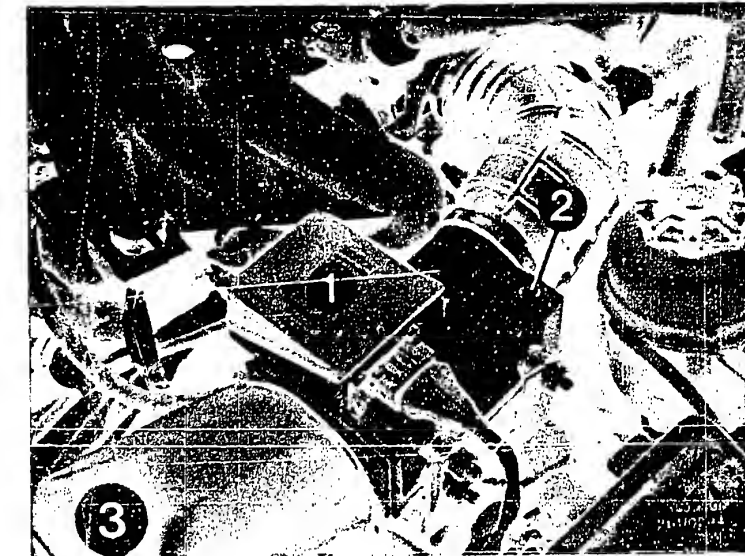
Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by retightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on J15/J16



528e:

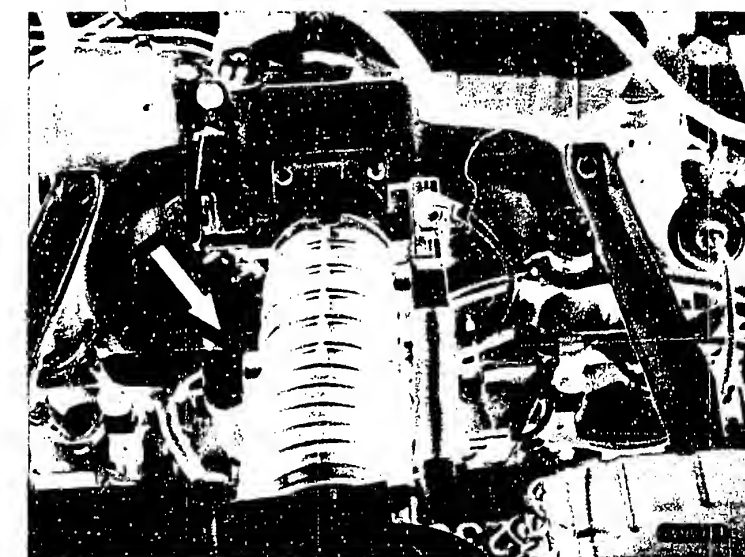
1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter

533i,633CSi,733i:

Arrow=Disconnect hose here for leak test.



**J13**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



**J14**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



Rough idle/incorrect idle speed (continued)

yes

Idle speed control (non-Bosch product) O.K.?

no

If engine hunts, replace control unit for idle speed control. Measure winding resistance of idle actuator.

Test specification at +20°C: 9 ... 10Ω

At idle speed, measure pulses at plug of idle actuator (see bottom diagram).

If no pulses present:

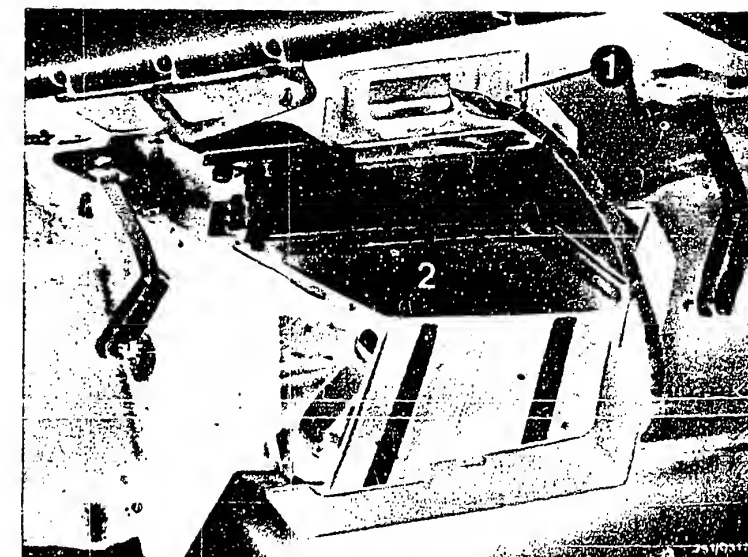
Check power supply to control unit for idle speed control or replace control unit for idle speed control.

Further cause of trouble:

Idle actuator mechanically defective.

yes

Continued on J17/J18

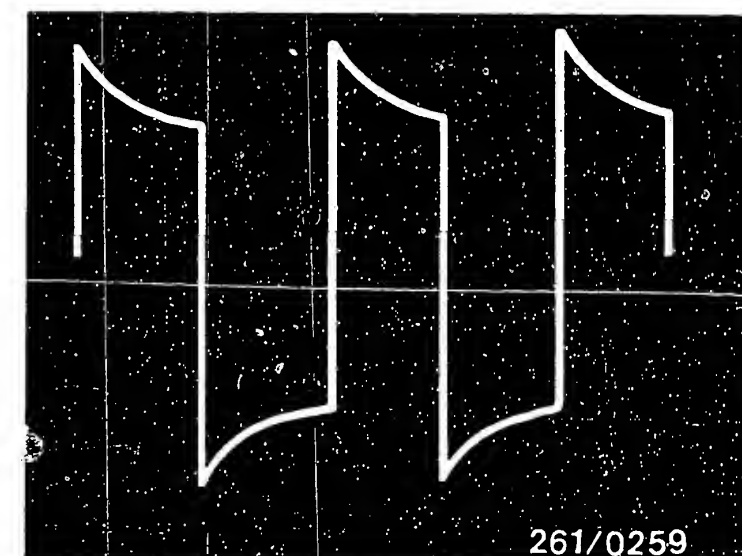


All models:

1=Control unit for idle speed control

2=Motronic control unit

Pulses at idle actuator at idle speed



**J 15**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)

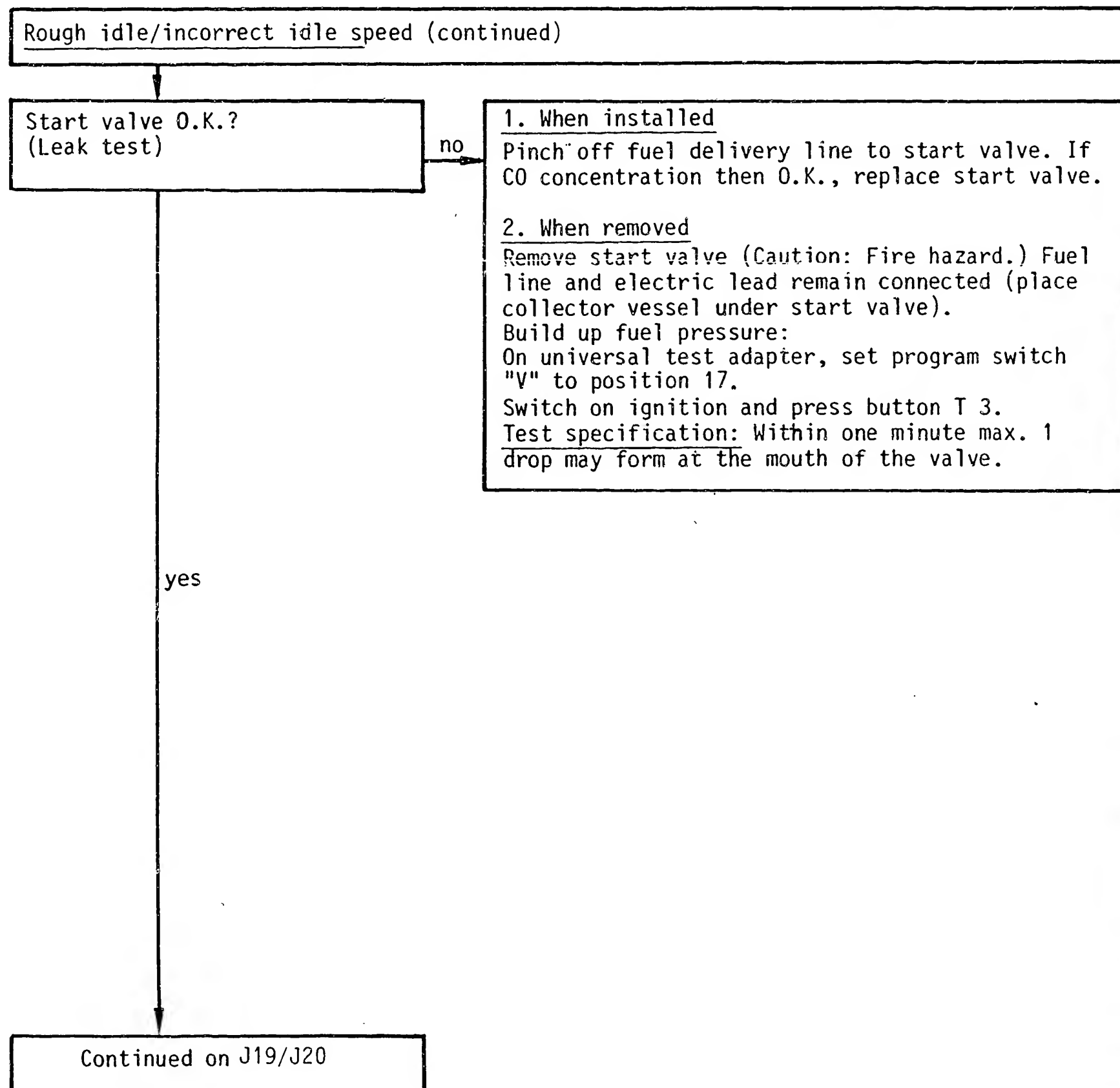


**J 16**

Rough engine idle

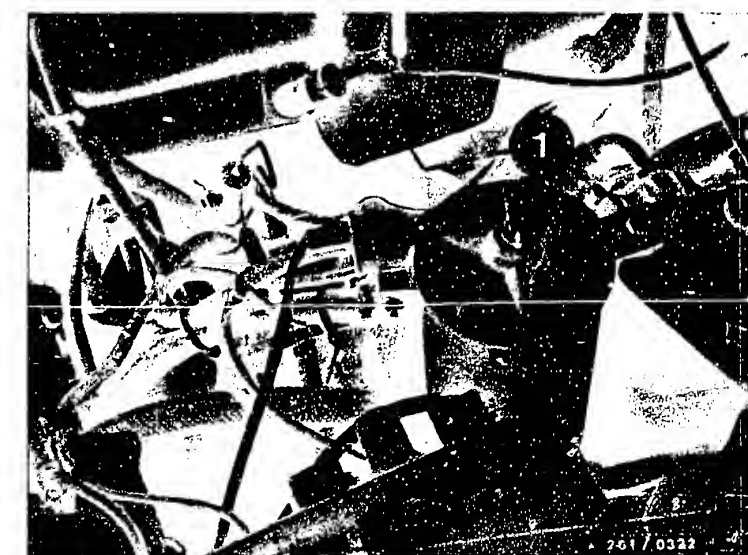
BMW 5, 6 and 7 series (USA, Japan)





528e:  
1=Idle actuator  
2=Start valve

533i,633CSi,733i:  
1=Start valve (at bottom on intake manifold)



Rough idle/incorrect idle speed (continued)

yes

Solenoid-operated injection:  
1. valve mechanically O.K.?  
2. O-rings O.K. (unmetered  
air)?

no

1. With the engine running, disconnect injection-valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve O.K.. If not, replace injection valve.

2. Defective O-rings at the protective sleeve lead to unmetered air and thus to leaning of the mixture.  
Defective O-rings at the fuel-distribution pipe connection lead to leaks. Replace defective O-rings.

3. Solenoid-operated injection valves clogged by deposits. Replace injection valves.

Removing the injection valves

Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe upward until the injection valves are out of the holes in the intake manifold.

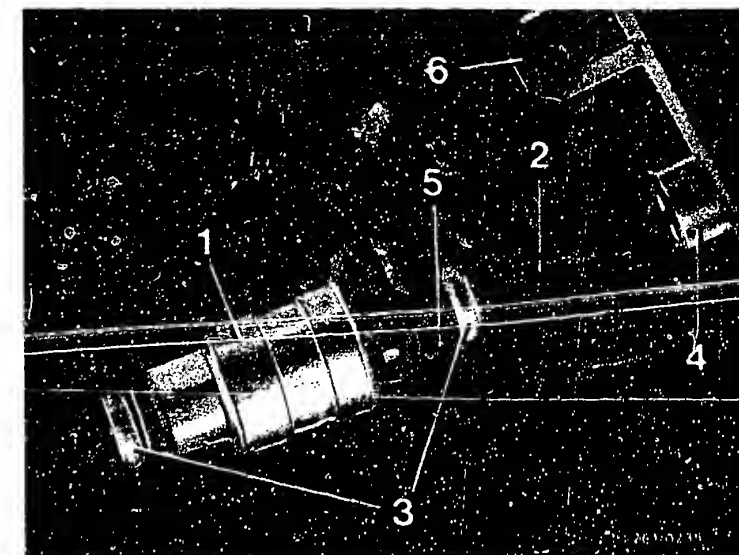
Do not damage nozzle needle.

Check nozzle needle and surrounding area for leaks and deposits. Remove electrical connection. Carefully slide holding clamps out of the groove and pull injection valve out of the fuel-distribution pipe connection.

yes

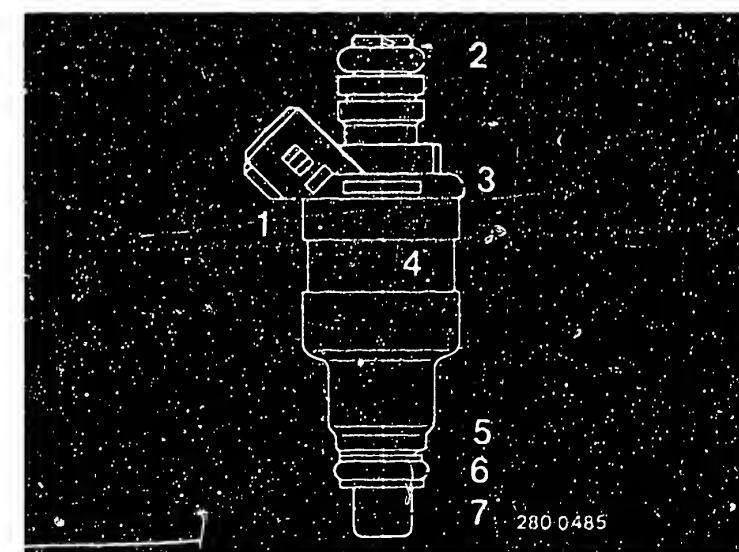
Continued on J23/J24

Continued on J21/J22



1=Injection valve  
2=Holding clamp  
3=Rubber seal (O-ring)  
4=Fuel-distribution pipe connection  
5=Groove  
6=Mounting bracket

2=upper O-ring  
6=lower O-ring  
7=Protective sleeve



**J19**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



**J20**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



## Rough idle/incorrect idle speed (continued)

yes

### Caution:

Catch escaping fuel. Do not allow to drip onto hot parts of the engine. Fire hazard.

### Caution:

Protective sleeve must not be levered off.

### Installing the injection valves

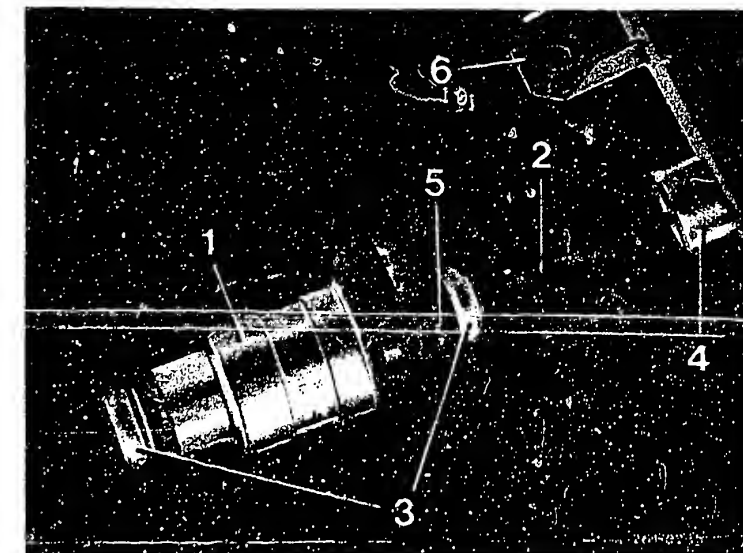
Replace O-rings if damaged or swollen.

Use parts set 1 287 010 704. Cut through lower O-ring (intake manifold). Warning: Do not damage protective sleeve. Fit new O-ring over protective sleeve and its bead. Do not damage any parts.

Before installing, check both rubber seals for correct seating. Secure injection valves on fuel-distribution pipe. Simultaneously press all injection valves with the fuel-distribution pipe into their seats. Screw on fuel-distribution pipe. Check all air and fuel hoses for correct seating.

Establish electrical connections.

Start engine and check whether any unmetered air is being drawn in.



1=Injection valve

2=Holding clamp

3=Rubber seal (O-ring)

4=Fuel-distribution pipe connection

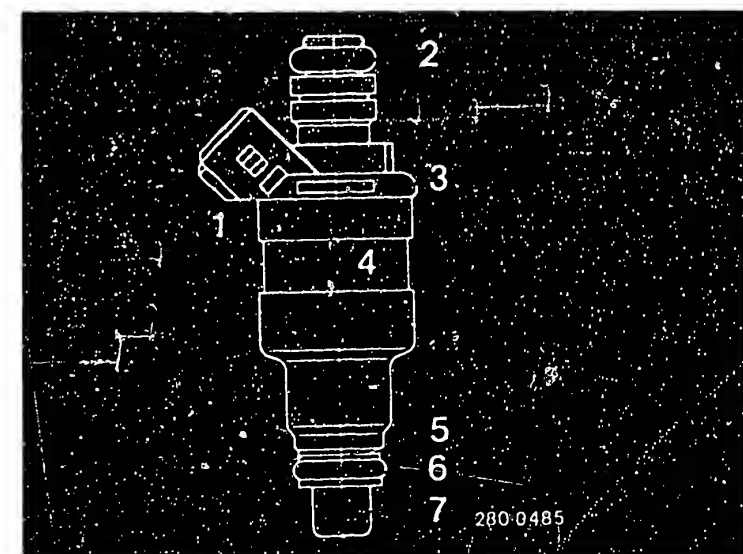
5=Groove

6=Mounting bracket

2=upper O-ring

6=lower O-ring

7=Protective sleeve



Continued on J23/J24

**J21**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



**J22**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



## Rough idle/incorrect idle speed (continued)

yes

Idle speed with engine at operating temperature:  
650...750 min<sup>-1</sup>

Exhaust-gas value with engine at operating temperature, measured before catalytic converter:

0.2...1.2 vol.%CO

Before testing, disconnect hose to carbon filter, switch off electrical devices and take apart lambda sensor plug connector.

no

- The idle speed is not adjustable. It is permanently set by the control unit for idle speed control and is determined by the idle actuator.
- Adjust exhaust gas with idle-mixture-adjusting screw in air-flow sensor. To do this, remove plug using special tools.

If CO not adjustable:

- CO concentration too low: Repeat leak test on air-intake system.
- CO concentration too high: Replace air-flow sensor.

Note: After adjusting CO, use new plug in air-flow sensor.

yes

Testing completed for customer complaint.

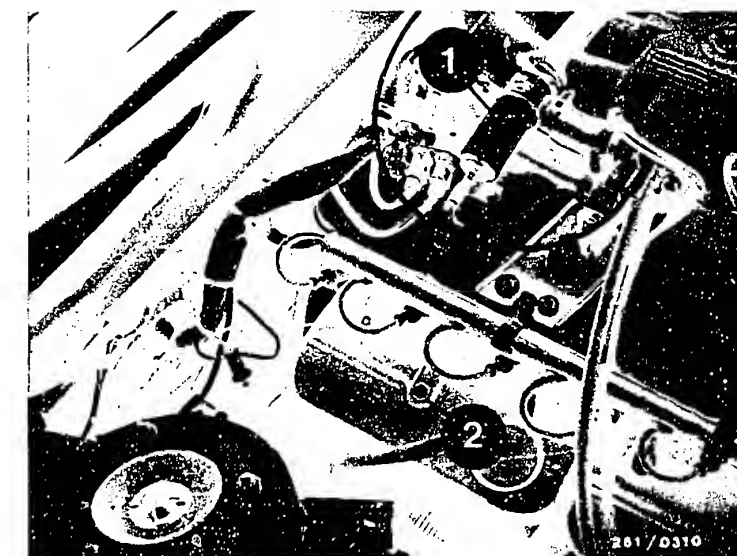
"Rough idle/incorrect idle speed".

Customer complaint remedied?

no

Further possibilities

- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



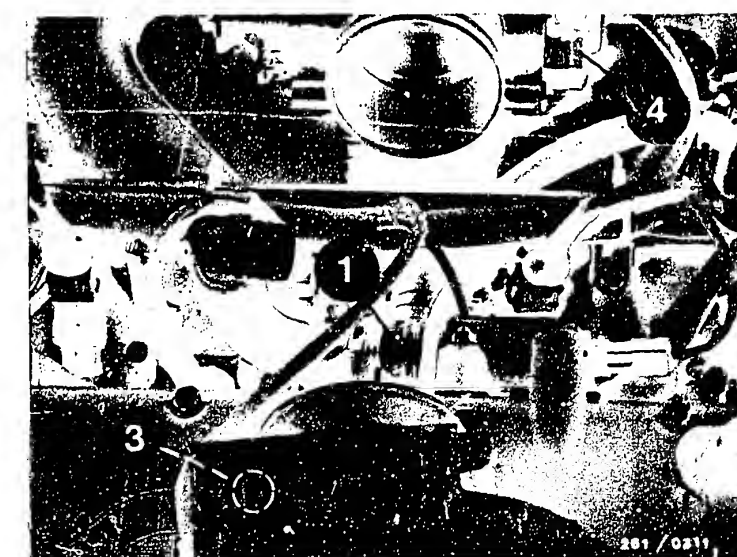
1=Idle actuator

533i, 633CSi, 733i:

2=CO test connection

3=Idle-mixture-adjusting screw in air-flow sensor

4=Throttle-valve switch



**J23**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)



**J24**

Rough engine idle

BMW 5, 6 and 7 series (USA, Japan)





## POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

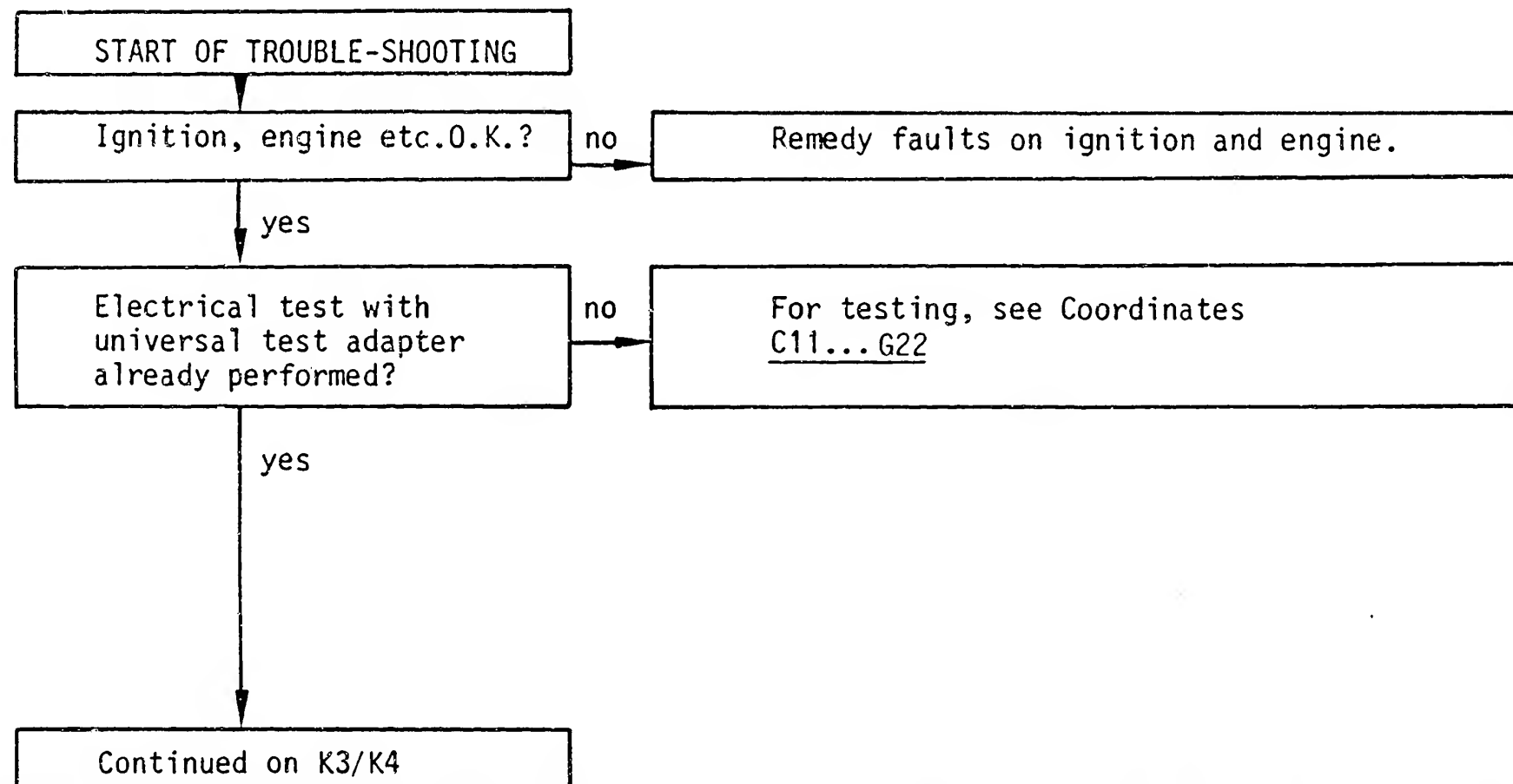
### Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**K1**

Poor throttle take-up  
BMW 5, 6 and 7 series (USA, Japan)



**K2**

Poor throttle take-up  
BMW 5, 6 and 7 series (USA, Japan)



# Poor throttle take-up (continued)

yes

Check secondary pattern of all cylinders.  
Secondary pattern O.K.?

no

Check ignition coil and high-tension part:  
Distributor cap oil-fouled outside and inside?  
(Unscrew distributor rotor and check camshaft seal).

## Notes:

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

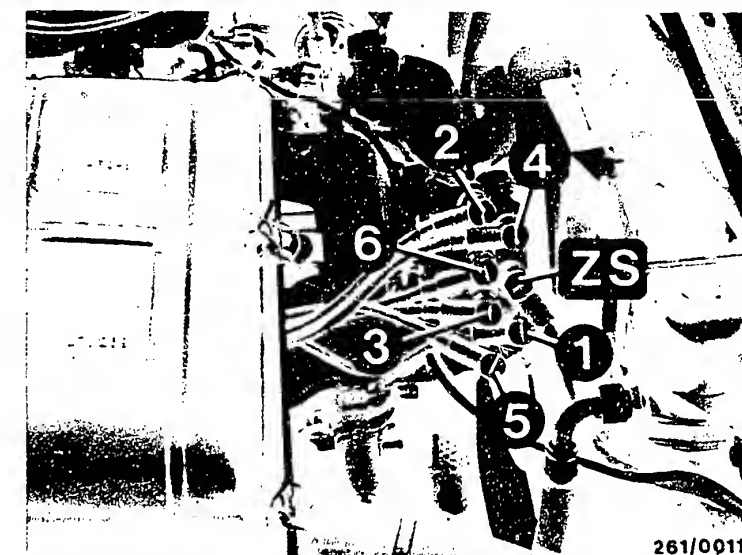
Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

## Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

yes

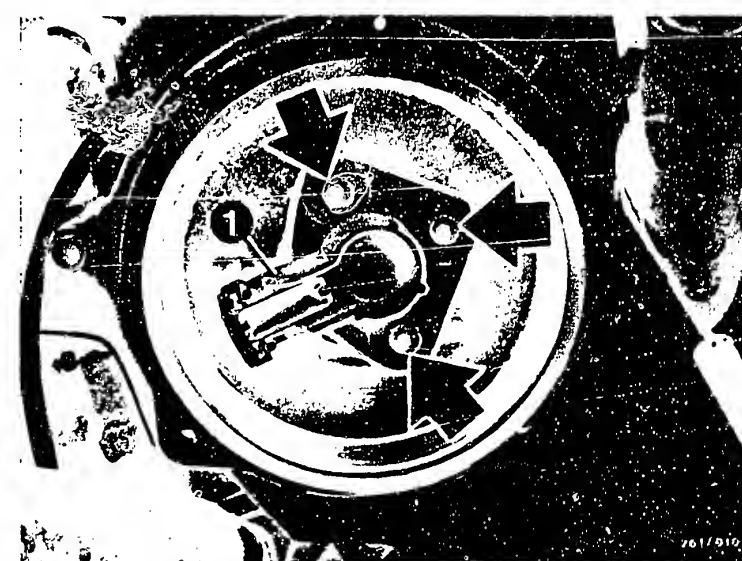
Continued on K5/K6



## High-voltage distributor

1 to 6=Cylinder numbers  
ZS=High-tension lead to ignition coil

1=Distributor rotor  
Arrows=Fastening screws



**K3**

Poor throttle take-up  
BMW 5, 6 and 7 series (USA, Japan)



**K4**

Poor throttle take-up  
BMW 5, 6 and 7 series (USA, Japan)



Poor throttle take-up (continued)

yes

Throttle valve closed?

no

Testing:

Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

Visual examination:

Loosen hose clamp and remove hose from throttle-valve assembly. Throttle valve set to hair's breadth gap? If necessary, make adjustment. After correcting, re-adjust throttle cable.

Adjusting the throttle-valve switch:

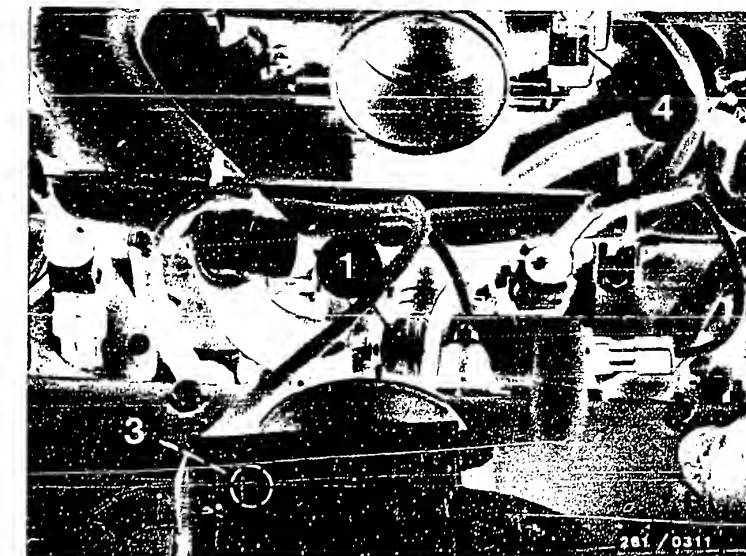
Slightly loosen fastening screws. Connect ohmmeter to throttle-valve switch term. 2 and ground. Turn operating lever to "full throttle" and slowly return to idle stop. Turn throttle-valve switch until the inner stop can be felt (reading 0  $\Omega$ ). Tighten screws.

Checking the adjustment:

Pull slightly on throttle cable. The idle contact must switch audibly (reading  $\infty \Omega$ ).

yes

Continued on K7/K8



533i, 633CSi, 733i:

1=Idle actuator

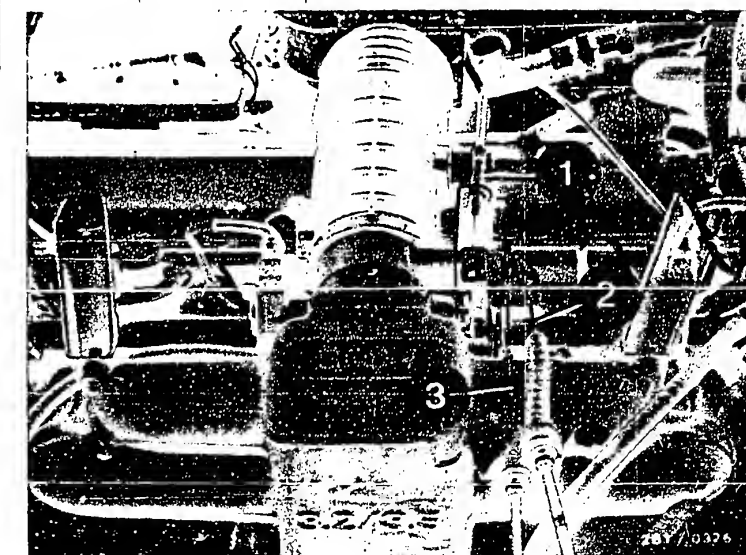
4=Throttle-valve switch

533i, 633CSi, 733i

1=Cable to transmission control

2=Cable to cruise control

3=Cable to accelerator



**K5**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



**K6**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



Poor throttle take-up (continued)

yes

Air-flow sensor mechanically  
O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

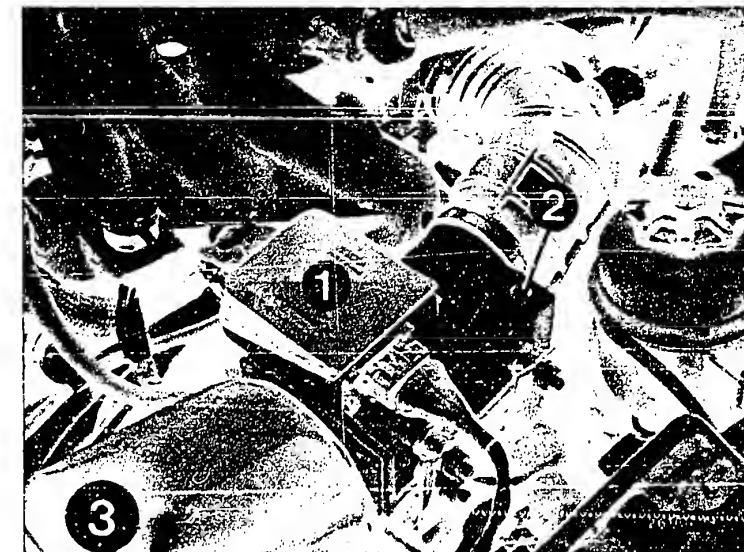
Potentiometer test (noise test):

Remove air-flow sensor. Leave plug on. Set motor-tester to "special input" and connect air-flow sensor term. 7 (2)\* (red clip) and term. 6 (4)\* (black clip). Set control lever for image adjustment on motortester as far as it will go to the left (calibrated setting). Switch on ignition. Deflect air-flow sensor flap suddenly several times. If air-flow sensor O.K., the oscilloscope must show a continuous stroke signal. If air-flow sensor is defective, there is a noise signal similar to the one shown opposite. Replace air-flow sensor. After testing, check spring contacts for security.

(\*) = New designations on air-flow sensor.

yes

Continued on K9/K10



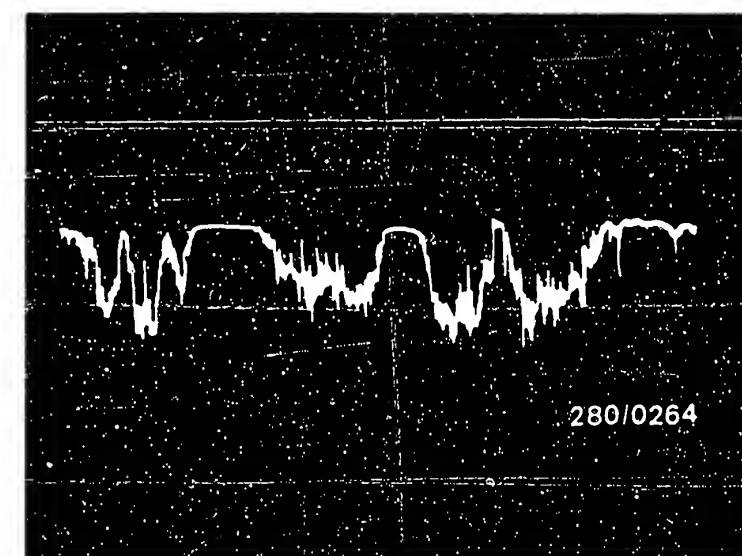
528e:

1=Air-flow sensor with NTC I

2=Idle-mixture-adjusting screw

3=Air filter

Noise signal if air-flow sensor  
defective



K7

Poor throttle take-up

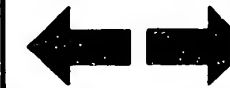
BMW 5, 6 and 7 series (USA, Japan)



K8

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



# Poor throttle take-up (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

## Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Injection valves mechanically O.K.?

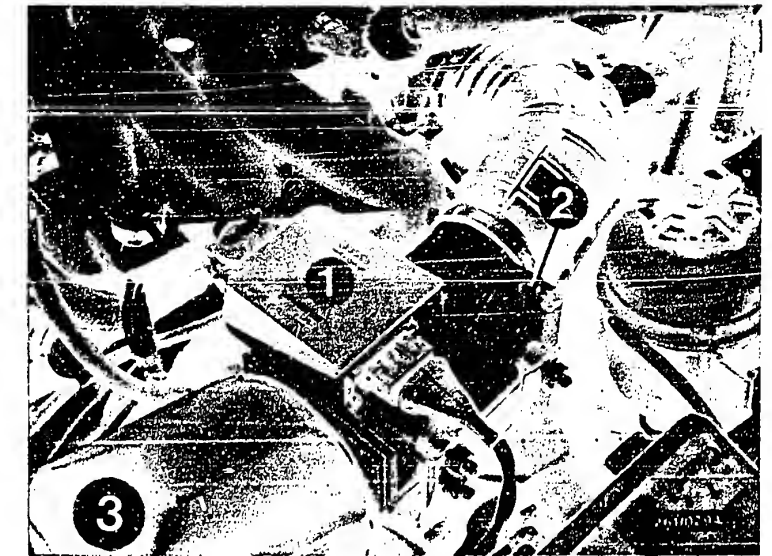
no

Injection valves may be clogged due to deposits. Replace injection valves.

yes

Continued on K15/K16

Continued on K11/K12



528e:

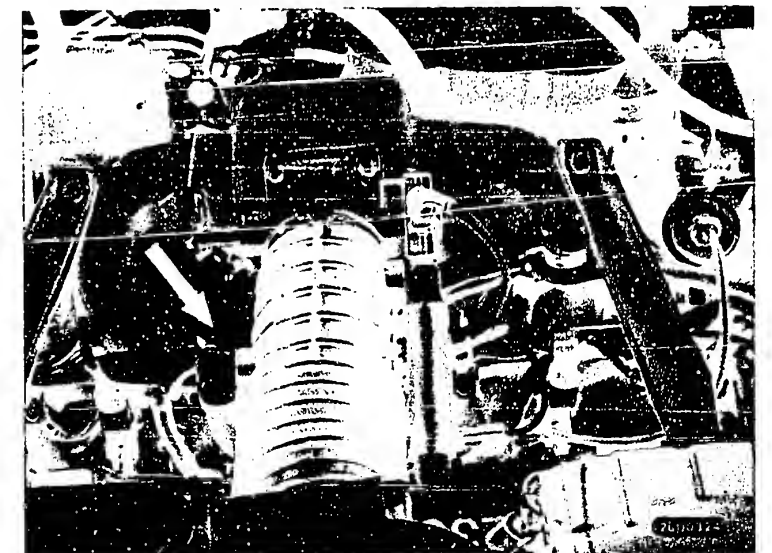
1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter

533i, 633CSi, 733i:

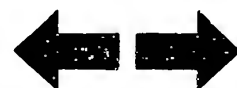
Arrow=Disconnect hose here for leak test.



**K9**

Poor throttle take-up

BMW 5, 6 and 7 series (USA/Japan)



**K10**

Poor throttle take-up

BMW 5, 6 and 7 series (USA/Japan)



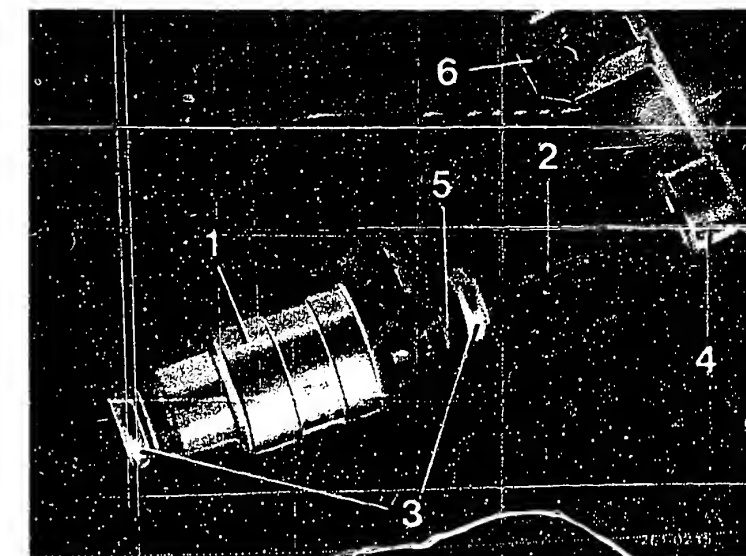
# Poor throttle take-up (continued)

yes

## Removing the injection valves

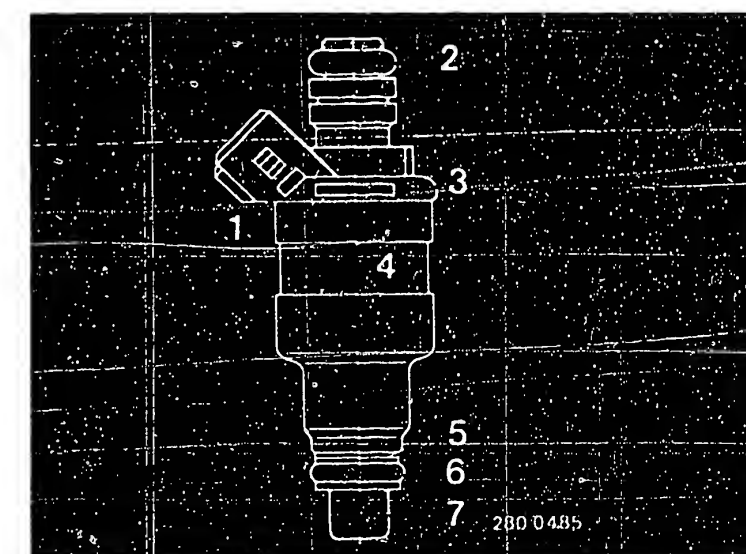
Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe upward until the injection valves are out of the holes in the intake manifold. Do not damage nozzle needle or rubber seals.

Check nozzle needle and surrounding area for leaks and deposits. Remove electrical connection. Carefully slide holding clamps out of the groove and pull injection valve out of the fuel-distribution pipe connection.



- 1=Injection valve
- 2=Holding clamp
- 3=Rubber seal (O-ring)
- 4=Fuel-distribution pipe connection
- 5=Groove
- 6=Mounting bracket

- 2=upper O-ring
- 6=lower O-ring
- 7=Protective sleeve



Continued on K15/K16

Continued on K13/K14

**K11**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



**K12**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)





# Poor throttle take-up (continued)

yes

## Caution:

Catch escaping fuel. Do not allow to drip onto hot parts of the engine. Fire hazard.

## Caution:

Protective sleeve must not be levered off.

## Installing the injection valves

Replace O-rings if damaged or swollen.

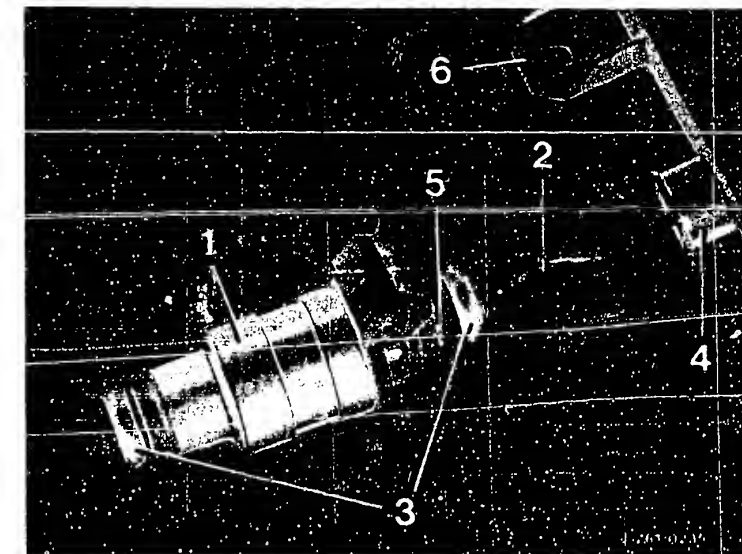
Use parts set 1 287 010 704. Cut through lower O-ring (intake manifold). Warning: Do not damage protective sleeve. Fit new O-ring over protective sleeve and its bead. Do not damage any parts.

Before installing, check both rubber seals for correct seating. Secure injection valves on fuel-distribution pipe. Simultaneously press all injection valves with the fuel-distribution pipe into their seats. Screw down fuel-distribution pipe. Check all air and fuel hoses for correct seating.

Establish electrical connections.

Start engine and check whether any unmetered air is being drawn in.

Continued on K15/K16



1=Injection valve

2=Holding clamp

3=Rubber seal (O-ring)

4=Fuel-distribution pipe connection

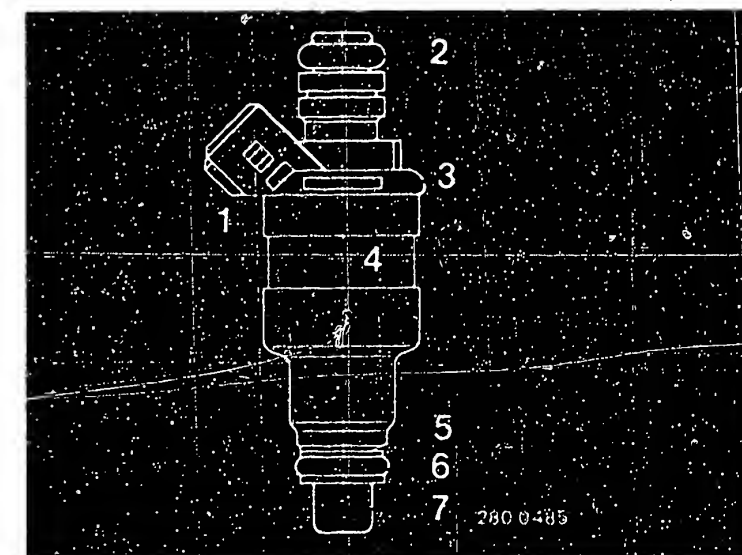
5=Groove

6=Mounting bracket

2=upper O-ring

6=lower O-ring

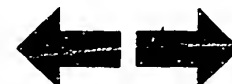
7=Protective sleeve



**K13**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



**K14**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



## Poor throttle take-up (continued)

yes

Idle speed control (non-Bosch product) O.K.?

no

If engine hunts, replace control unit for idle speed control. Measure winding resistance of idle actuator.

Test specification at +20°C: 9 ... 10Ω

At idle speed, measure pulses at plug of idle actuator (see bottom diagram).

If no pulses present:

Check power supply to control unit for idle speed control or replace control unit for idle speed control.

Further cause of trouble:

Idle actuator mechanically defective.

yes

Testing completed for customer complaint

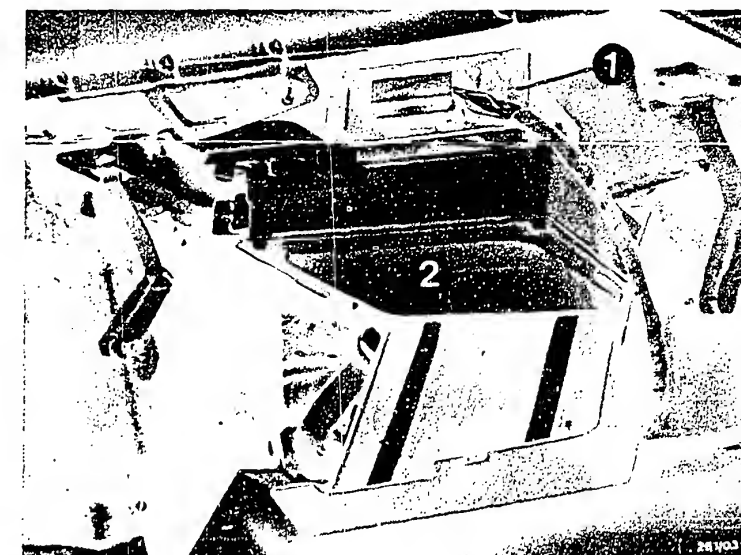
"Poor throttle take-up"

Customer complaint remedied?

no

Further possibilities:

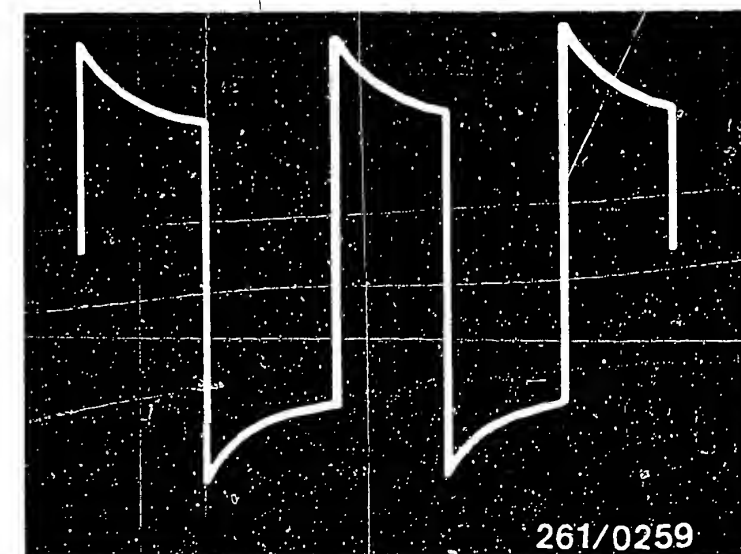
- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).



All models:

1=Control unit for idle speed control  
2=Motronic control unit

Pulses at idle actuator at idle speed



261/0259

**K15**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



**K16**

Poor throttle take-up

BMW 5, 6 and 7 series (USA, Japan)



## ENGINE MISSING UNDER ALL OPERATING CONDITIONS

Trouble-shooting program according to customer complaint

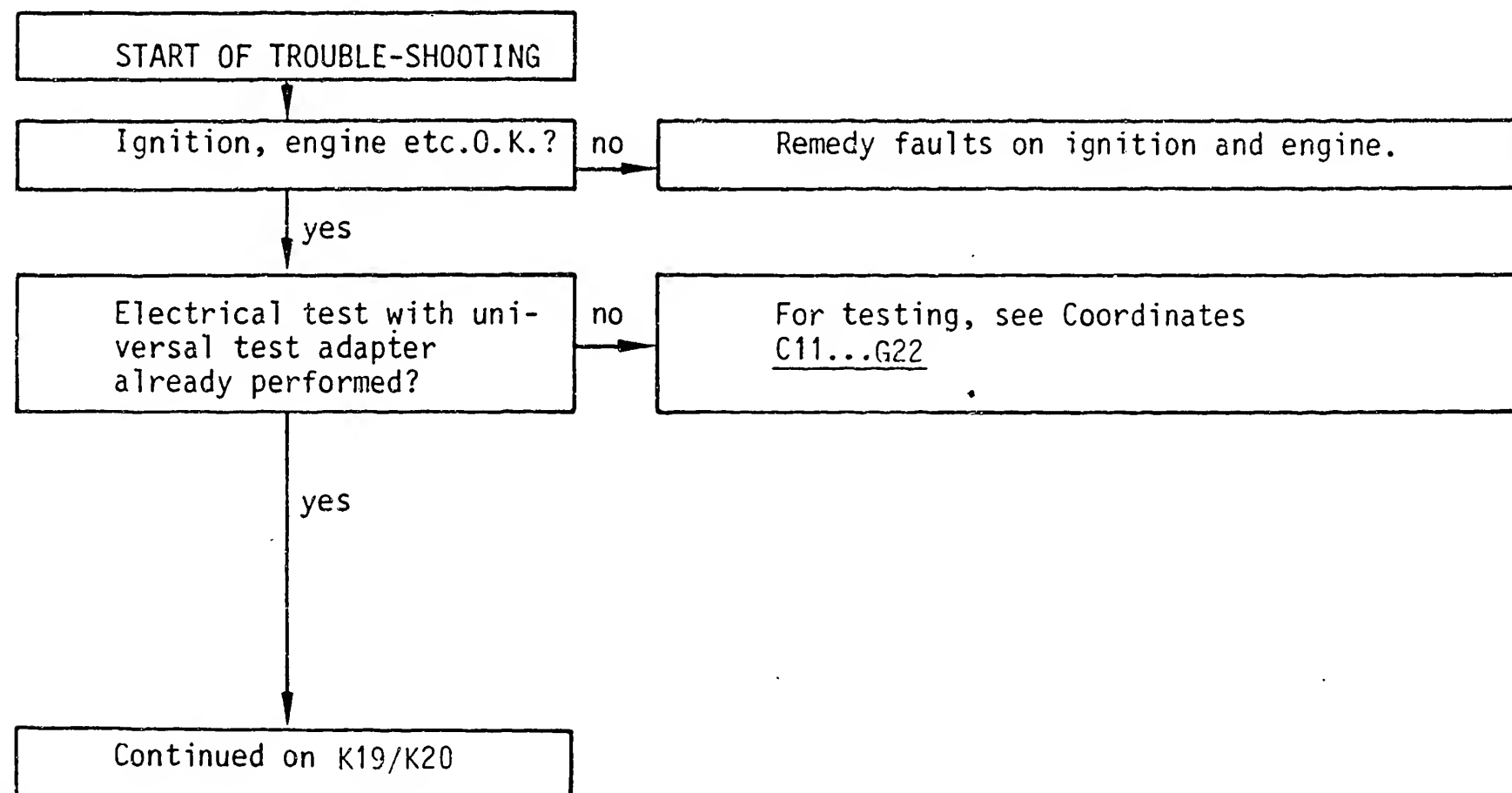
### Procedure

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If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**K17**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



**K18**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



# Engine missing under all operating conditions (continued)

yes

Check secondary pattern of all cylinders.  
Secondary pattern O.K.?

no

## Notes:

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

## Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

yes

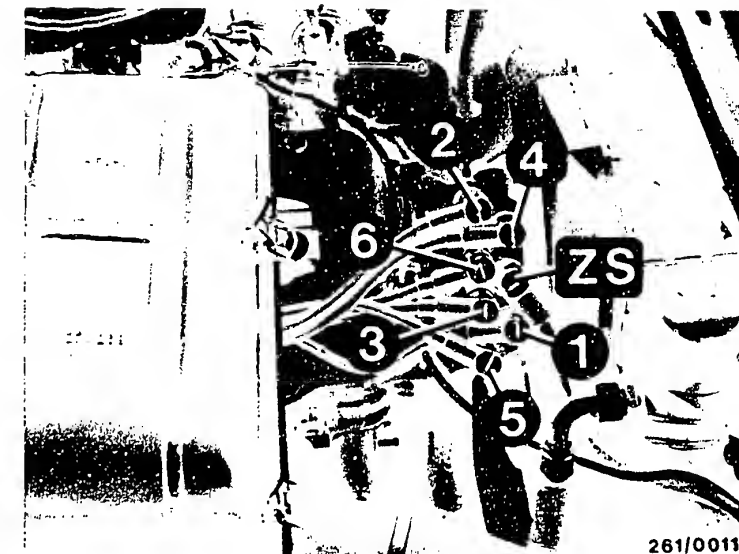
Plug-in connections of wiring harness and ground terminal O.K.?

no

Look for engine missing as a result of loose contacts as follows: Run engine, if possible, on chassis dynamometer. Keep engine speed constant and watch for missing while moving wiring harness and plug-in connections. Pay particular attention to plug-in connections on engine-speed and reference-mark sensors. Ground terminal securely tightenend? Check plug-in connections for proper seating and corrosion. Spring contacts must be latched and must not allow themselves to be pushed back. Check ground leads for continuity and loose contacts.

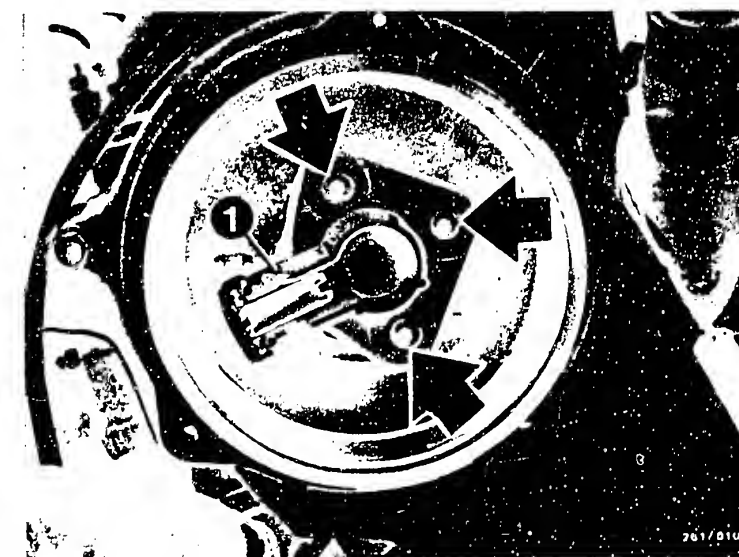
yes

Continued on K21/K22



High-voltage distributor  
1 to 6=Cylinder numbers  
ZS=High-tension lead to ignition coil

1=Distributor rotor  
Arrows=Fastening screws



**K19**

Engine missing  
BMW 5, 6 and 7 series (USA, Japan)



**K20**

Engine missing  
BMW 5, 6 and 7 series (USA, Japan)



Engine missing under all operating conditions (continued)

yes

Air-flow sensor mechanically O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

Potentiometer test (noise test):

Remove air-flow sensor. Leave plug on. Set motor-tester to "special input" and connect air-flow sensor term. 7 (2)\* (red clip) and term. 6 (4)\* (black clip). Set control lever for image adjustment on motortester as far as it will go to the left (calibrated setting). Switch on ignition. Deflect air-flow sensor flap suddenly several times. If air-flow sensor O.K., the oscilloscope must show a continuous stroke signal. If air-flow sensor is defective, there is a noise signal similar to the one shown opposite. Replace air-flow sensor. After testing, check spring contacts for security.

(\*) = New designations on air-flow sensor.

yes

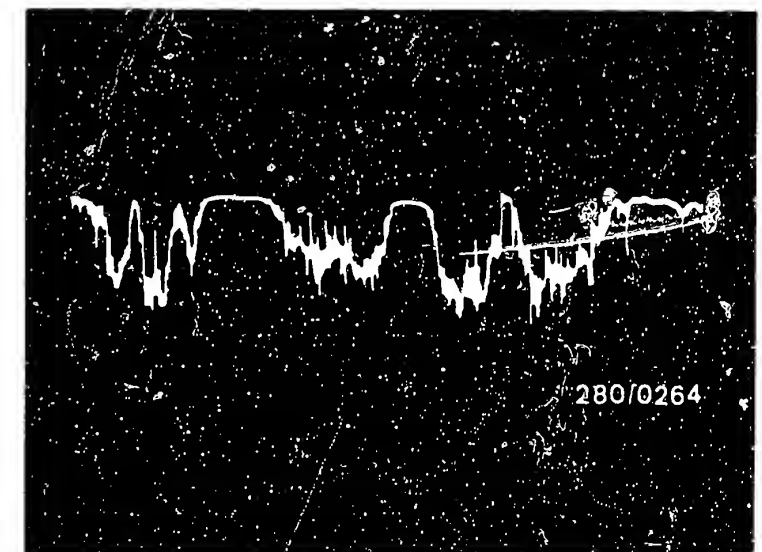
Continued on K23/K24



528e:

1=Air-flow sensor with NTC I  
2=Idle-mixture-adjusting screw  
3=Air filter

Noise signal if air-flow sensor defective



**K21**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



**K22**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



Engine missing under all operating conditions (continued)

yes

Fuel delivery O.K.?

no

Measuring the fuel delivery:

For testing, undo junction between fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extent hose and lead into a 5 l vessel with graduated scale. Build up fuel pressure. On universal test adapter, set program switch "V" to 17. Switch on ignition and press button T3.

Test specification-528e: min. 750 cm<sup>3</sup>/30s

3.2 l engine: min. 950 cm<sup>3</sup>/30s

Remedy if test specification not obtained

- Fuel filter clogged - replace.
- Voltage at fuel pump plugs, with engine running, min. 12 V. If not, clean contacts, possibly eliminate poor ground connection. Replace leads.
- Check pre-supply pump.

Listen: Disconnect plug from electric fuel pump. Build up fuel pressure: On universal test adapter, set program switch "V" to position 17. Switch on ignition and press button T3. Pre-supply pump must operate. If not, check connecting leads and, if necessary, replace pre-supply pump.

yes

Continued on L1/L2

Continued on L1/L2



528e (6 and 7 series similar)

1=Air hose to intake manifold

2=Pressure regulator

3=Return hose

1=Fuel delivery line

2=Fuel return line

Arrows=Plugs, 2-pin pre-supply pump,  
3-pin immersion-tube sensor



**K23**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



**K24**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)





Engine missing under all operating conditions (continued)

yes

- Fuel-pressure regulator defective - replace. The fuel-pressure regulator is mounted on the fuel-distribution pipe with two fastening screws and an O-ring. After removing the pressure regulator, replace the O-ring and the flat ring (use parts set 1 287 010 704).
- Fuel pump delivery insufficient - replace fuel pump.
- Strainer in tank clogged?  
Corrosion in tank?

Engine coughing on overrun?

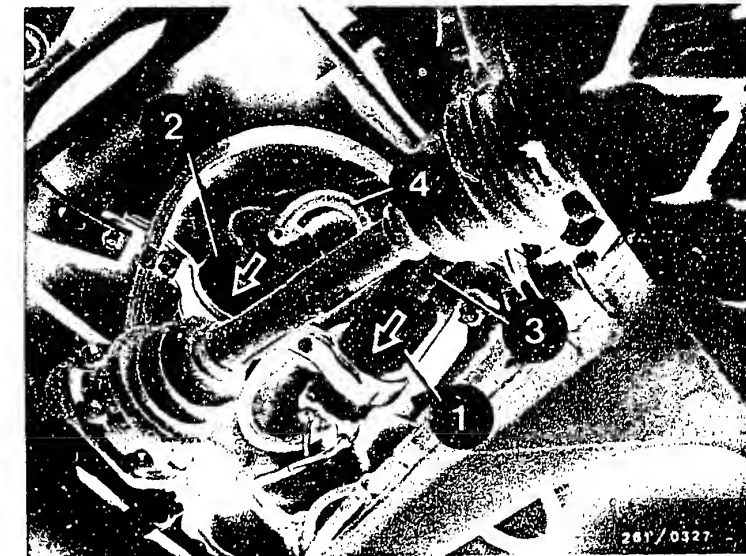
no

1. Check exhaust system for leaks.
2. Throttle valve closed?  
Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.  
Visual examination:  
Loosen hose clamp and remove hose from throttle-valve assembly. Throttle valve set to hair's breadth gap? If necessary, make adjustment at idle stop screw. After correcting, re-adjust throttle cable.

yes

Continued on L3/L4

Continued on L3/L4

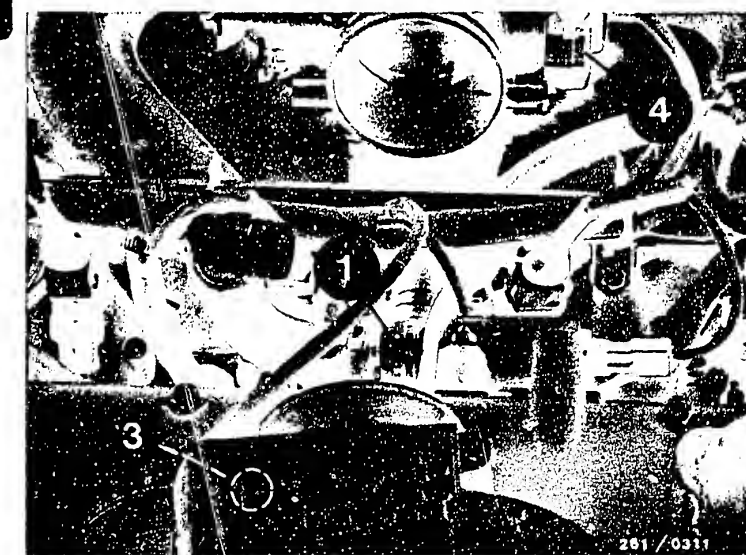


528e, 633CSi, 533i, (733i similar)

- 1=Fuel pump  
2=Fuel filter  
3=Fuel intake line  
4=Fuel delivery line  
Arrow=Direction of fuel flow

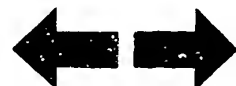
533i, 633CSi, 733i

- 1=Idle actuator  
4=Throttle-valve switch



**L1**

Engine missing  
BMW 5, 6 and 7 series (USA, Japan)



**L2**

Engine missing  
BMW 5, 6 and 7 series (USA, Japan)



Engine missing under all operating conditions (continued)

yes

Adjusting the throttle-valve switch:

Slightly loosen fastening screws. Connect ohm-meter to throttle-valve switch term. 2 and ground. Turn operating lever to "full throttle" and slowly return to idle stop. Turn throttle-valve switch until the inner stop can be felt (reading 0  $\Omega$ ). Tighten screws.

Checking the adjustment:

Pull slightly on throttle cable. The idle contact must switch audibly (reading  $\infty \Omega$ ).

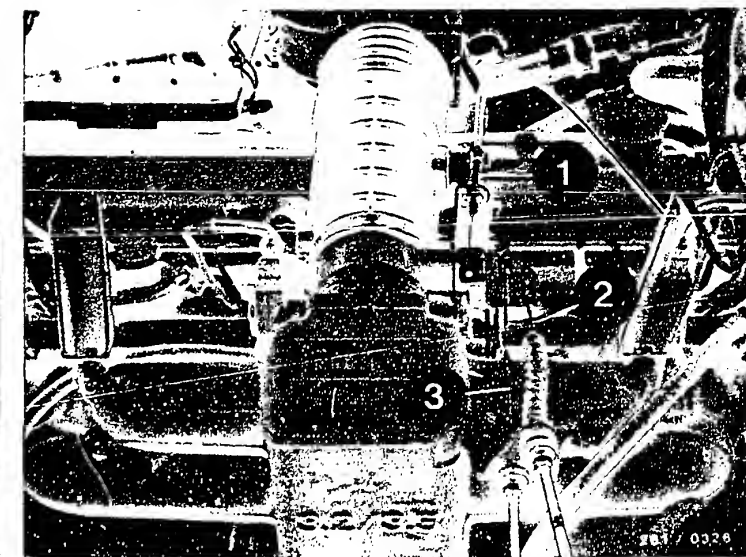
Control unit O.K.?

no

Let engine run. Shake control unit lightly and move multiple plug. Watch for engine missing. Repair plug-in connections on multiple plug or replace defective control unit.

yes

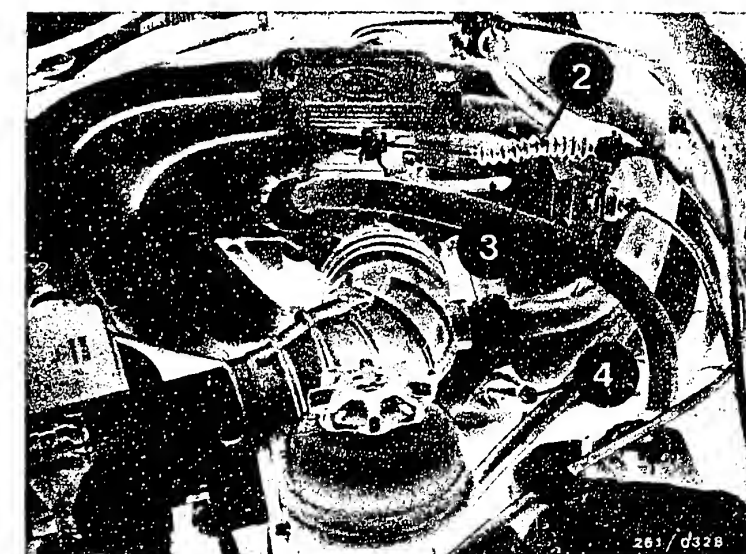
Continued on L5/L6



633CSi, 733i

1=Cable to transmission control  
2=Cable to cruise control  
3=Cable to accelerator  
4=Ground terminal

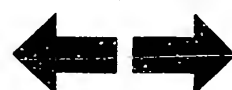
528e:



**L3**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



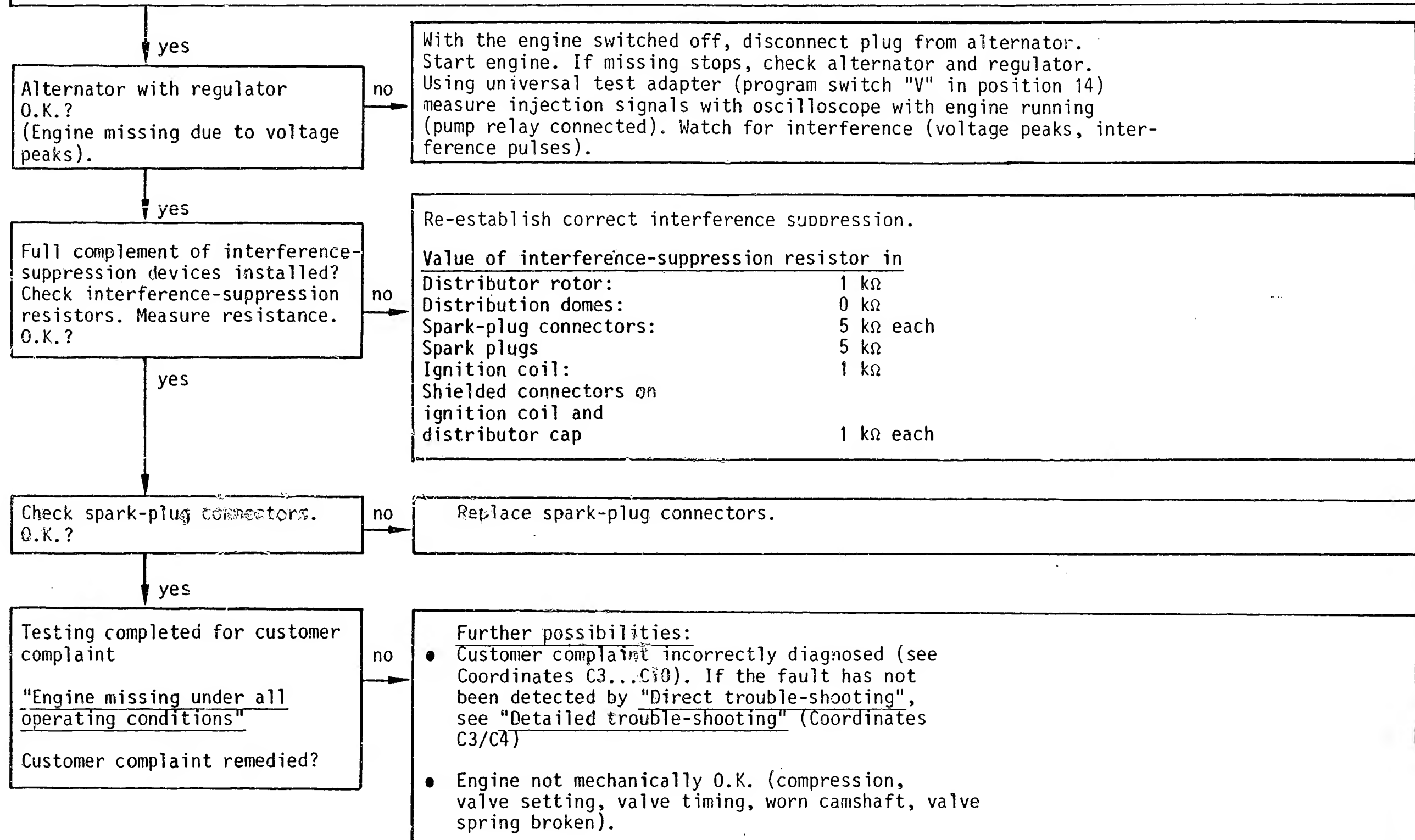
**L4**

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



Engine missing under all operating conditions (continued)



L5

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



L6

Engine missing

BMW 5, 6 and 7 series (USA, Japan)



## FUEL CONSUMPTION TOO HIGH

### Trouble-shooting program according to customer complaint

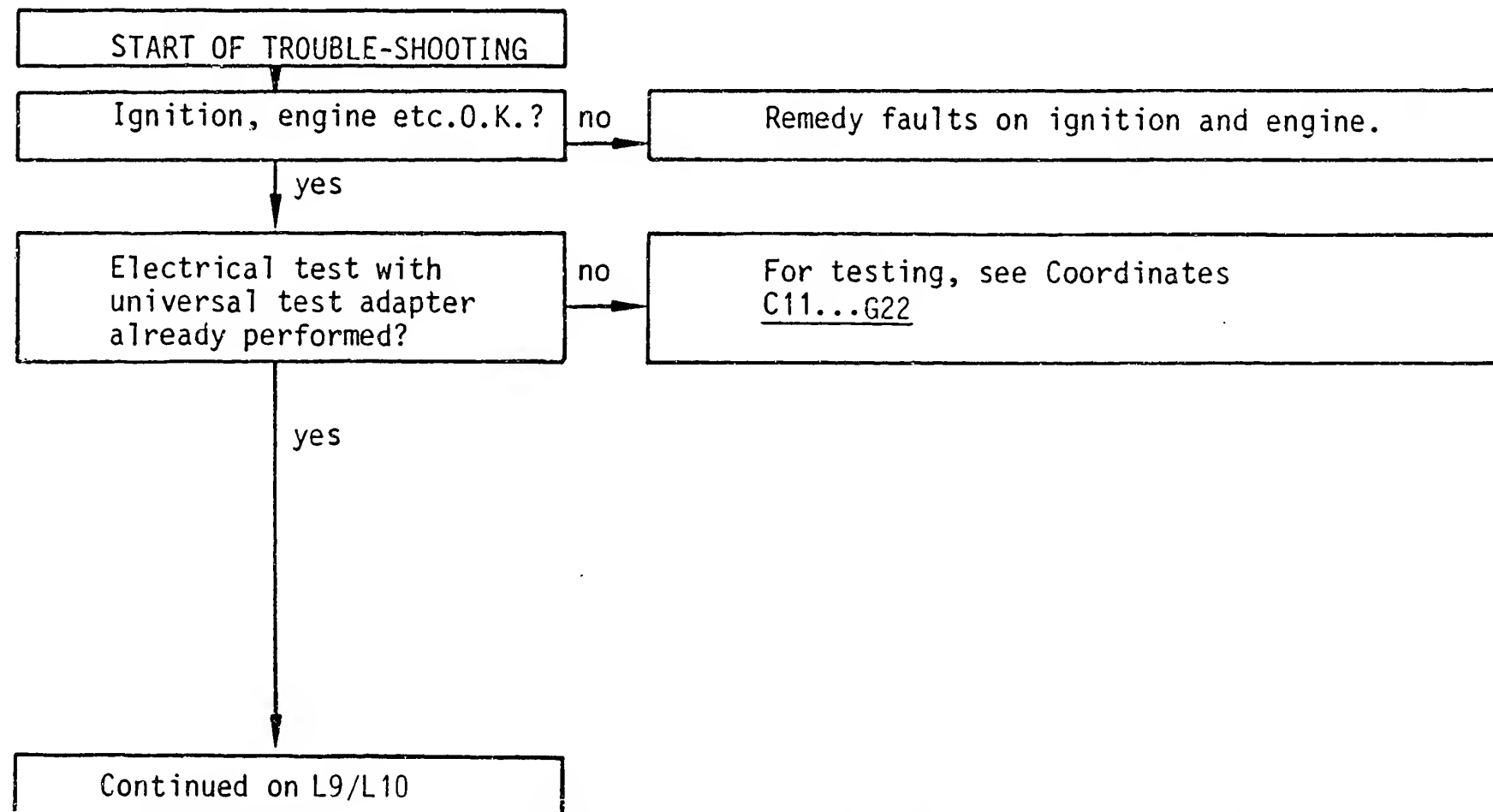
#### Procedure

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If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**L7**

Fuel consumption too high  
BMW 5, 6 and 7 series (USA, Japan)



**L8**

Fuel consumption too high  
BMW 5, 6 and 7 series (USA, Japan)



# Fuel consumption too high (continued)

yes

Check secondary pattern of all cylinders.  
Secondary pattern O.K.?

no

## Notes:

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

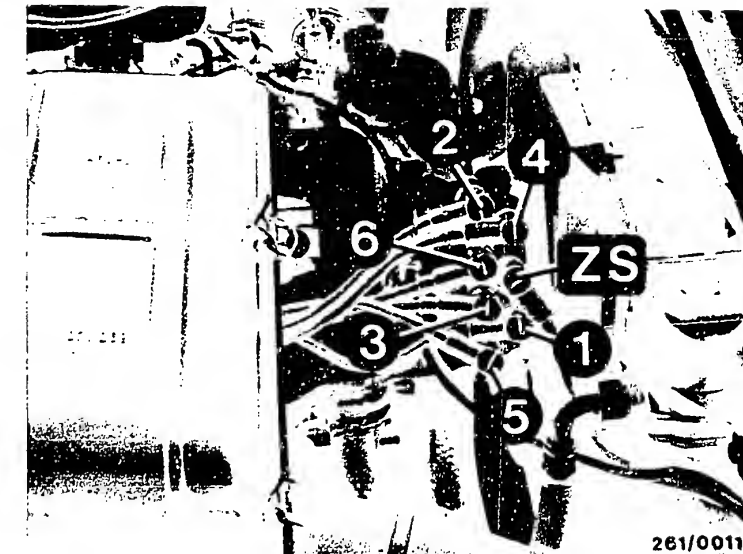
Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

## Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

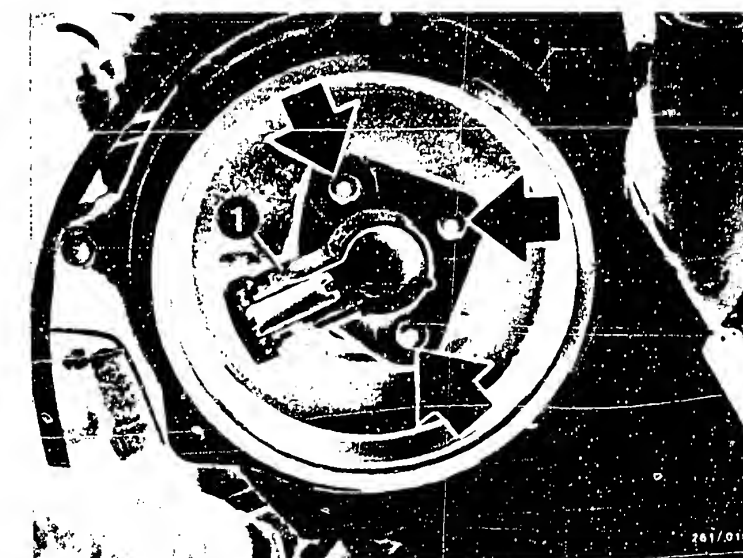
yes

Continued on L11/L12



High-voltage distributor  
1 to 6=Cylinder numbers  
ZS=High-tension lead to ignition coil

1=Distributor rotor  
Arrows=Fastening screws



**L9**

Fuel consumption too high  
BMW 5, 6 and 7 series (USA, Japan)



**L10**

Fuel consumption too high  
BMW 5, 6 and 7 series (USA, Japan)



Fuel consumption too high (continued)

yes

Are all brakes free?

yes

Start valve O.K.?  
(Leak test)

no

1. When installed

Pinch off fuel delivery line to start valve. If CO concentration then O.K., replace start valve.

2. When removed

Remove start valve (Caution: Fire hazard.) Fuel line and electric lead remain connected (place collector vessel under start valve).

Build up fuel pressure:

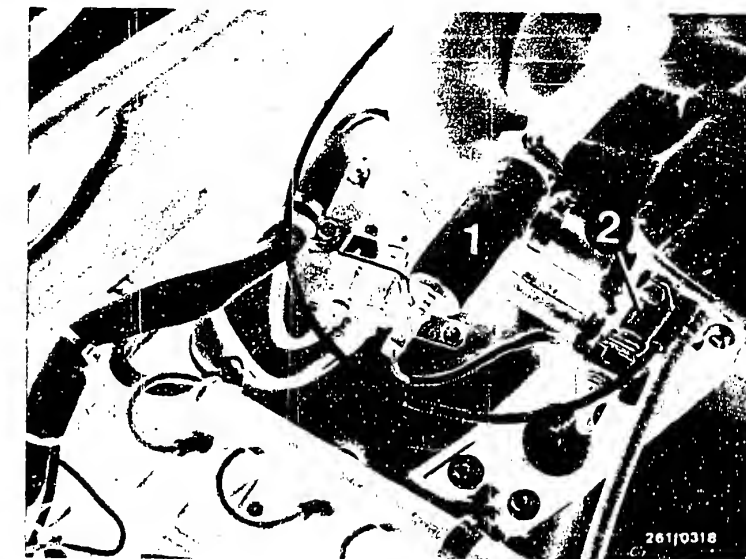
On universal test adapter, set program switch "V" to position 17.

Switch on ignition and press button T 3.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Continued on L13/L14



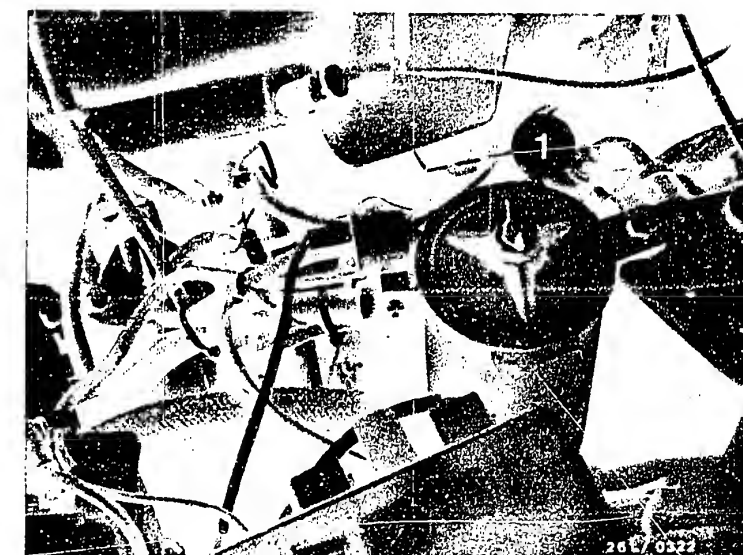
528e:

1=Idle actuator

2=Start valve

533i, 633CSi, 733i:

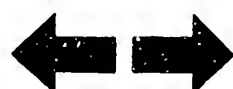
1=Start valve (at bottom on intake manifold)



**L11**

Fuel consumption too high

BMW 5, 6 and 7 series (USA, Japan)



**L12**

Fuel consumption too high

BMW 5, 6 and 7 series (USA, Japan)





Fuel consumption too high (continued)

yes

Air-flow sensor mechanically O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Are injection valves leak-tight?

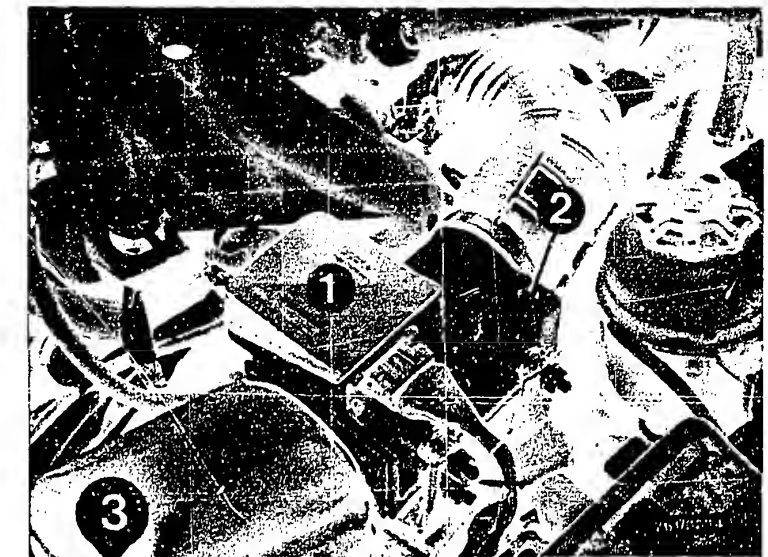
no

Removal of injection valves and leak test  
Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe up until the injection valves are out of the holes in the intake manifold. Do not damage nozzle needle and rubber seal.  
Build up fuel pressure. On universal test adapter, program switch "V" at 17.  
Switch on ignition and press button T 3.  
Check nozzle needle and environs for leaks and deposits.

yes

Continued on L17/L18

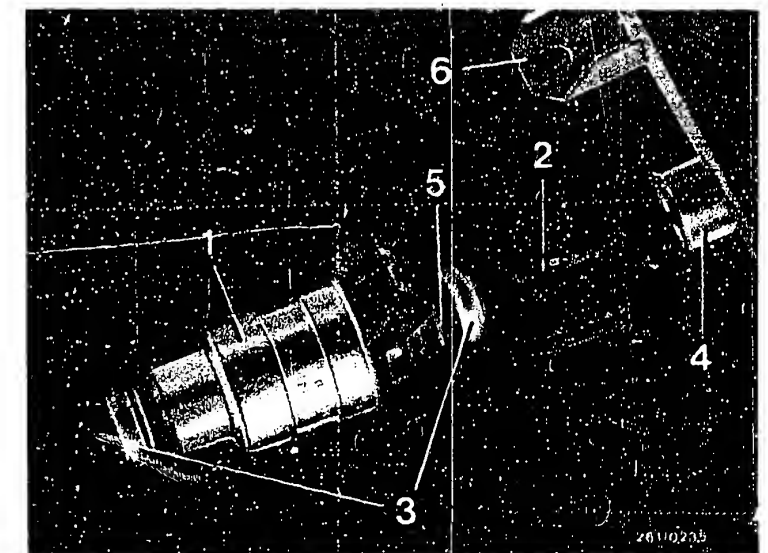
Continued on L15/L16



528e:

1=Air-flow sensor with NTC I  
2=Idle-mixture-adjusting screw  
3=Air filter

1=Injection valve  
2=Holding clamp  
3=Rubber seal (O-ring)  
4=Fuel-distribution pipe connection  
5=Groove  
6=Mounting bracket



**L13**

Fuel consumption too high

BMW 5, 6 and 7 series (USA, Japan)



**L14**

Fuel consumption too high

BMW 5, 6 and 7 series (USA, Japan)



Fuel consumption too high (continued)

yes

Disconnect electrical connection.

Carefully slide holding clamps out of the grooves and withdraw injection valve from the fuel-distribution pipe connection.

Caution:

Catch escaping fuel. Do not allow to drip onto hot parts of the engine. Fire hazard.

Caution:

Protective sleeve must not be levered off.

Installing the injection valves

Replace O-rings if damaged or swollen.

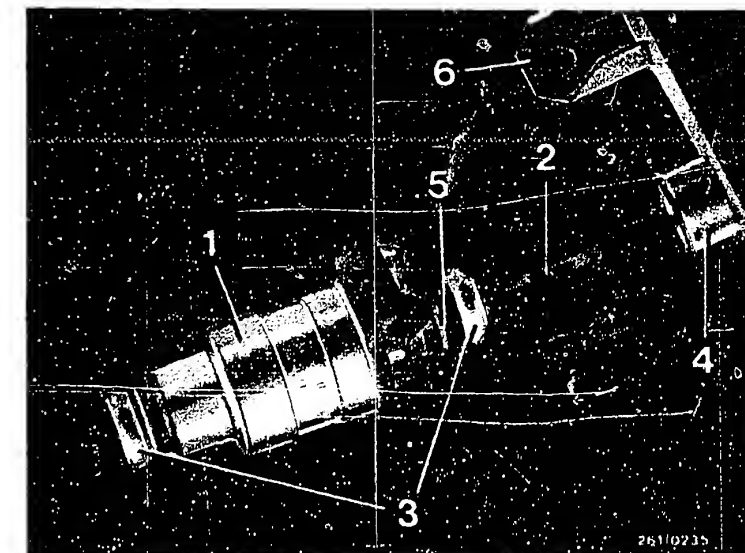
Use parts set 1 287 010 704. Cut through lower O-ring (intake manifold). Warning: Do not damage protective sleeve. Fit new O-ring over protective sleeve and its bead. Do not damage any parts.

Before installing, check both rubber seals for correct seating. Secure injection valves on fuel-distribution pipe. Simultaneously press all injection valves with the fuel-distribution pipe into their seats. Screw down fuel-distribution pipe. Check all air and fuel hoses for correct seating.

Establish electrical connections.

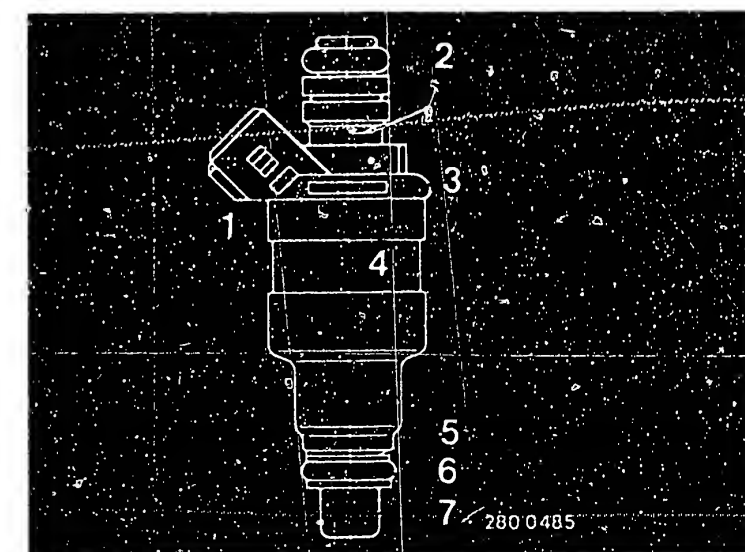
Start engine and check whether any unmetered air is being drawn in.

Continued on L17/L18



- 1=Injection valve
- 2=Holding clamp
- 3=Rubber seal (O-ring)
- 4=Fuel-distribution pipe connection
- 5=Groove
- 6=Mounting bracket

- 2=upper O-ring
- 6=lower O-ring
- 7=Protective sleeve



**L15**

Fuel consumption too high  
BMW 5, 6 and 7 series (USA, Japan)



**L16**

Fuel consumption too high  
BMW 5, 6 and 7 series (USA, Japan)



## Fuel consumption too high (continued)

yes

Idle speed with engine at operating temperature:  
 $650 \dots 750 \text{ min}^{-1}$

Exhaust-gas value with engine at operating temperature, measured before catalytic converter:  
 $0.2 \dots 1.2 \text{ vol.\%CO}$

Before testing, disconnect hose to carbon filter, switch off electrical devices and take apart lambda sensor plug connector.

no

- The idle speed is not adjustable. It is permanently set by the control unit for idle speed control and is determined by the idle actuator.
- Adjust exhaust gas with idle-mixture-adjusting screw in air-flow sensor. To do this, remove plug using special tools.

If CO not adjustable:

- CO concentration too low: Repeat leak test on air-intake system.
- CO concentration too high: Replace air-flow sensor.

Note: After adjusting CO, use new plug in air-flow sensor.

yes

Testing completed for customer complaint.

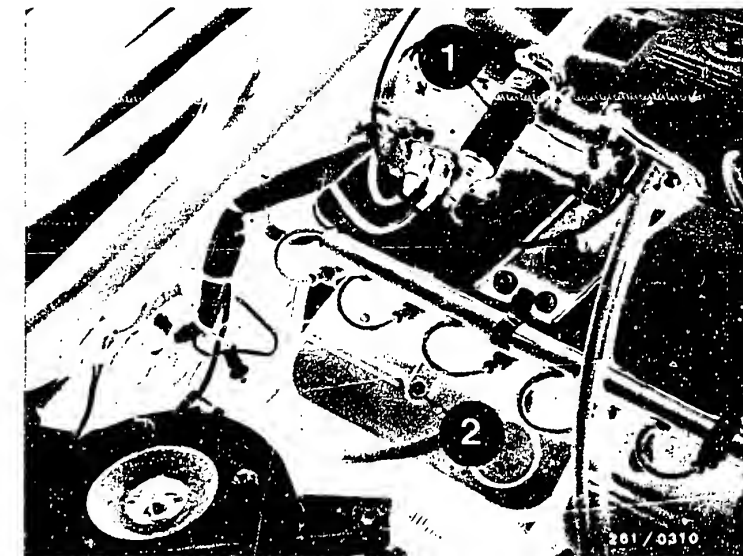
Fuel consumption too high

Customer complaint remedied?

no

Further possibilities

- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



528e

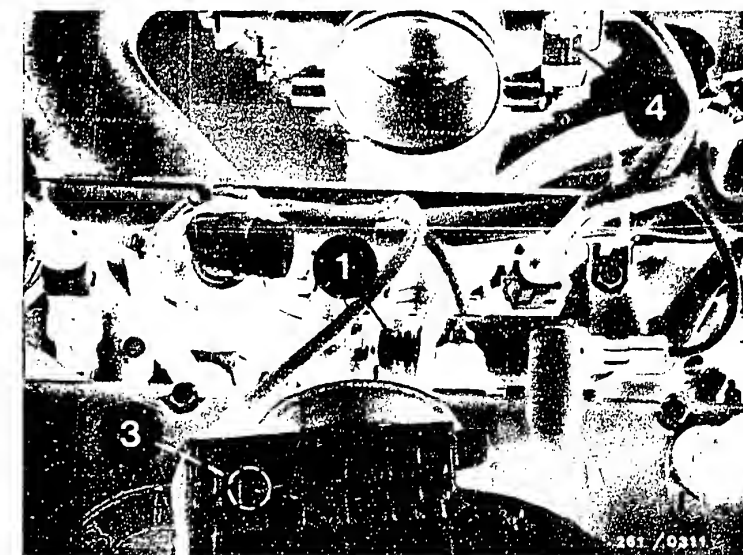
1=Air flow sensor

2=CO test connection

3=Idle-mixture-adjusting screw in air-flow sensor

4=Throttle-valve switch

533i; 633CSi; 733i



**L17**

Fuel consumption too high

BMW 5, 6 and 7 series (USA, Japan)



**L18**

Fuel consumption too high

BMW 5, 6 and 7 series (USA, Japan)



## MAXIMUM ENGINE POWER/TOP SPEED NOT REACHED

### Trouble-shooting program according to customer complaint

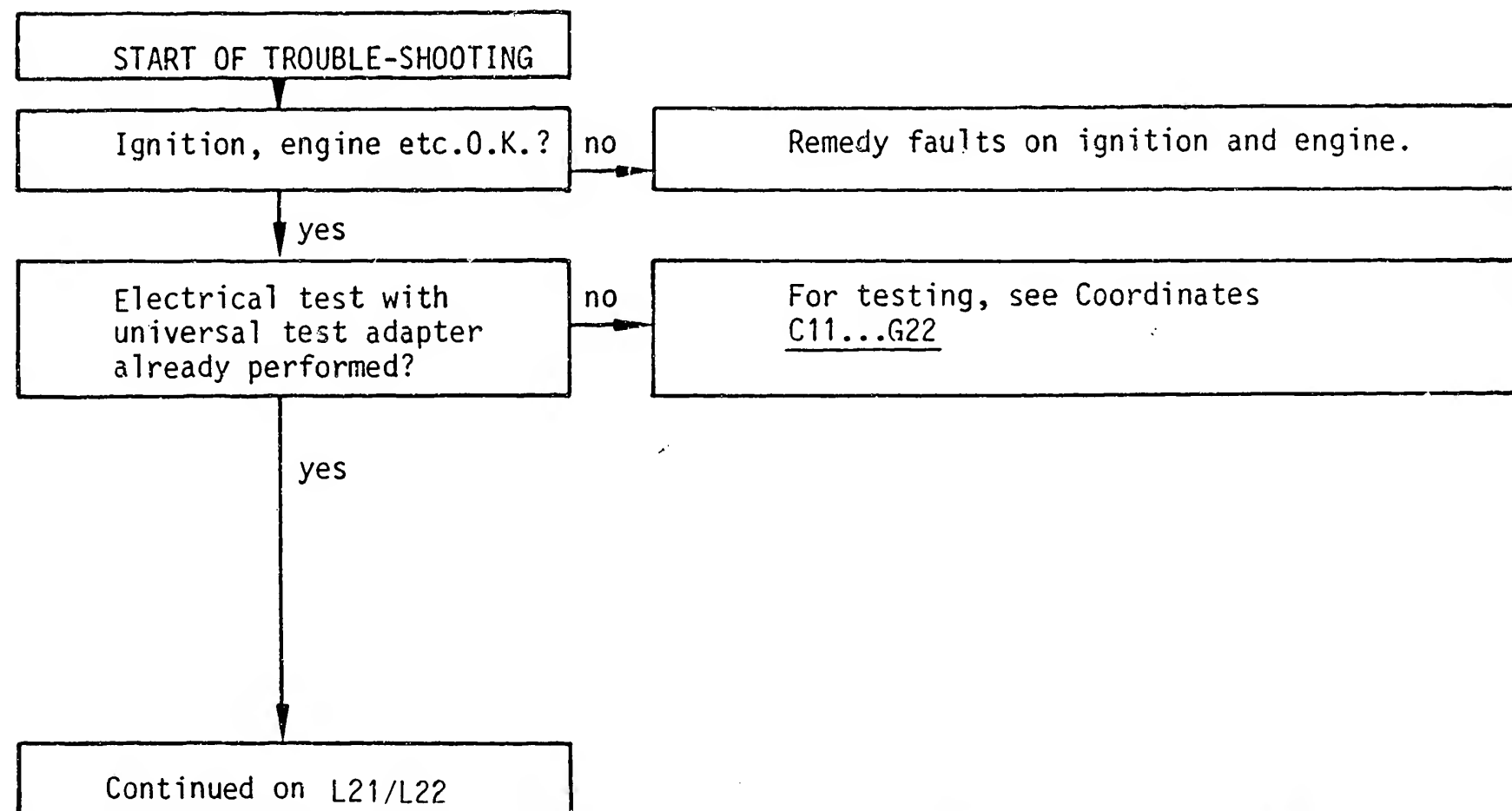
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If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**L19**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



**L20**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



Maximum engine power/top speed not reached (continued)

yes  
Check secondary pattern of all cylinders.  
Secondary pattern O.K.?

no

**Notes:**

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx.  $0\ \Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

yes

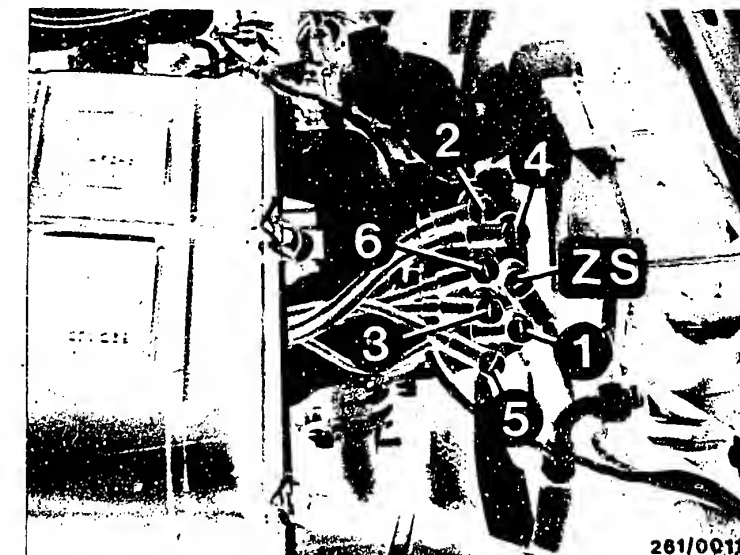
Throttle valve opening fully?

no

Throttle cable, accelerator O.K.?  
Accelerator may stick due to floor mat etc.  
Check pressure point for "kickdown".

yes

Continued on L23/L24



High-voltage distributor  
1 to 6=Cylinder numbers  
ZS=High-tension lead to ignition coil

1=Distributor rotor  
Arrows=Fastening screws



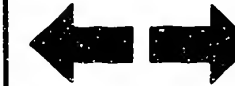
**L21**

No maximum engine power  
BMW 5, 6 and 7 series (USA, Japan)



**L22**

No maximum engine power  
BMW 5, 6 and 7 series (USA, Japan)



Maximum engine power/top speed not reached (continued)

yes

Air-flow sensor O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Air-intake passage clear?

no

Air filter clogged.

yes

Injection valves mechanically O.K.?

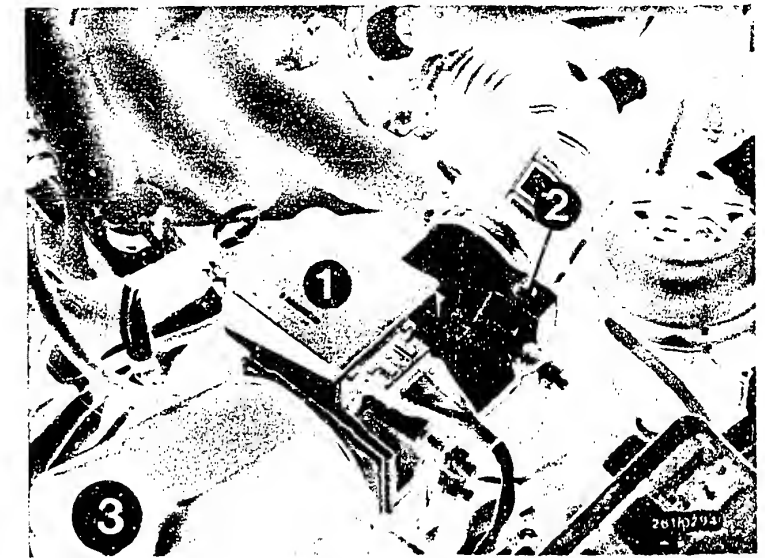
no

Injection valves may be clogged due to deposits.

yes

Continued on M5/M6

Continued on M1/M2



528e:

1=Air-flow sensor

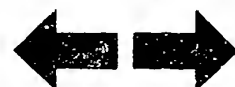
2=Idle-mixture-adjusting screw

3=Air filter

**L23**

No maximum engine power

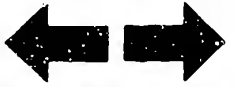
BMW 5, 6 and 7 series (USA, Japan)



**L24**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)





Maximum engine power/top speed not reached (continued)

yes

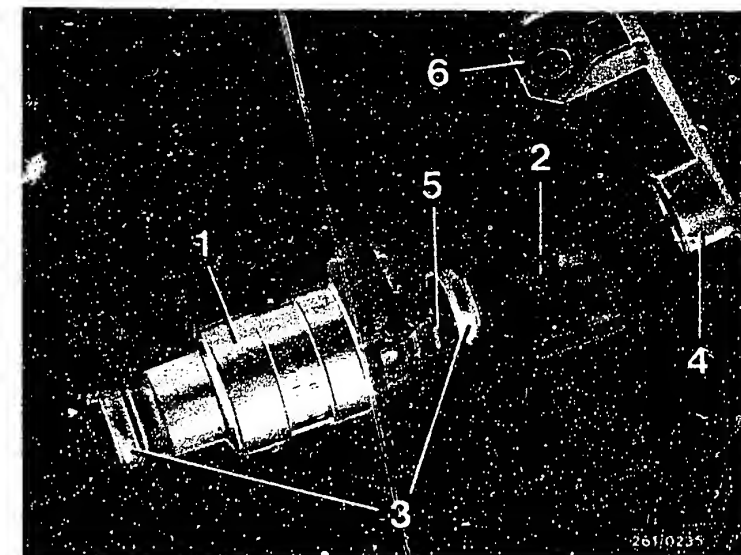
Continued on M5/M6

### Removing the injection valves

Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe upward until the injection valves are out of the holes in the intake manifold. Do not damage nozzle needle or rubber seals.

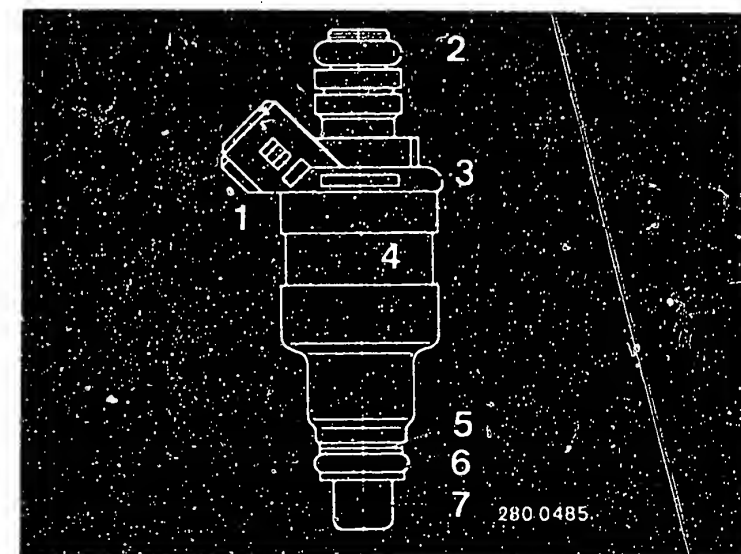
Check nozzle needle and surrounding area for leaks and deposits. Remove electrical connection. Carefully slide holding clamps out of the groove and pull injection valve out of the fuel-distribution pipe connection.

Continued on M3/M4



- 1=Injection valve
- 2=Holding clamp
- 3=Rubber seal (O-ring)
- 4=Fuel-distribution pipe connection
- 5=Groove
- 6=Mounting bracket

- 2=upper O-ring
- 6=lower O-ring
- 7=Protective sleeve



**M1**

No maximum engine power

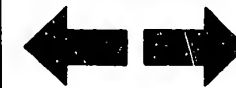
BMW 5, 6 and 7 series (USA, Japan)



**M2**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



Maximum engine power/top speed not reached (continued)

yes

Caution:

Catch escaping fuel. Do not allow to drip onto hot parts of the engine. Fire hazard.

Caution:

Protective sleeve must not be levered off.

Installing the injection valves

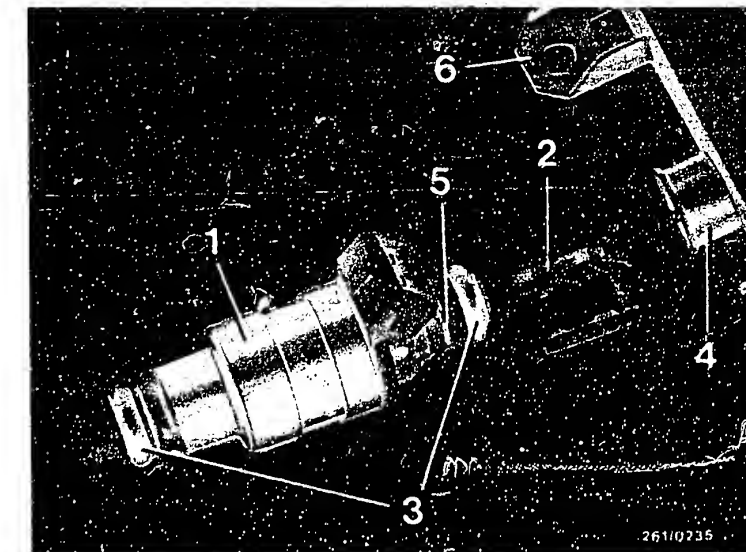
Replace O-rings if damaged or swollen.

Use parts set 1 287 010 704. Cut through lower O-ring (intake manifold). Warning: Do not damage protective sleeve. Fit new O-ring over protective sleeve and its bead. Do not damage any parts.

Before installing, check both rubber seals for correct seating. Secure injection valves on fuel-distribution pipe. Simultaneously press all injection valves with the fuel-distribution pipe into their seats. Screw down fuel-distribution pipe. Check all air and fuel hoses for correct seating.

Establish electrical connections.

Start engine and check whether any unmetered air is being drawn in.



1=Injection valve

2=Holding clamp

3=Rubber seal (O-ring)

4=Fuel-distribution pipe connection

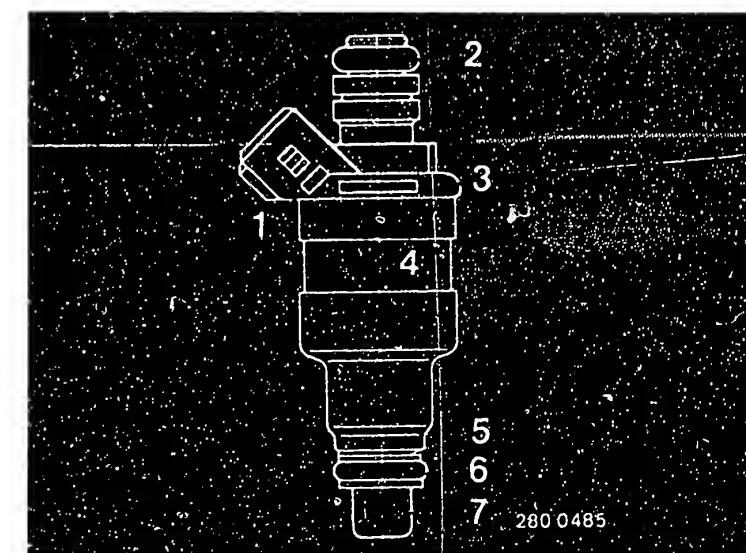
5=Groove

6=Mounting bracket

2=upper O-ring

6=lower O-ring

7=Protective sleeve

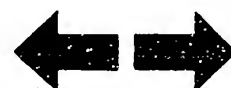


Continued on M5/M6

**M3**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



**M4**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



Maximum engine power/top speed not reached (continued)

yes

Fuel delivery O.K.?

no

Measuring the fuel delivery:

For testing, undo junction between fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extent hose and lead into a 5 l vessel with graduated scale. Build up fuel pressure. On universal test adapter, set program switch "V" to 17. Switch on ignition and press button T3.

Test specification-528e: min. 750 cm<sup>3</sup>/30s

3.2 l engine: min. 950 cm<sup>3</sup>/30s

Remedy if test specification not obtained

- Fuel filter clogged - replace.
- Voltage at fuel pump plugs, with engine running, min. 12 V. If not, clean contacts, possibly eliminate poor ground connection. Replace leads.
- Check pre-supply pump.

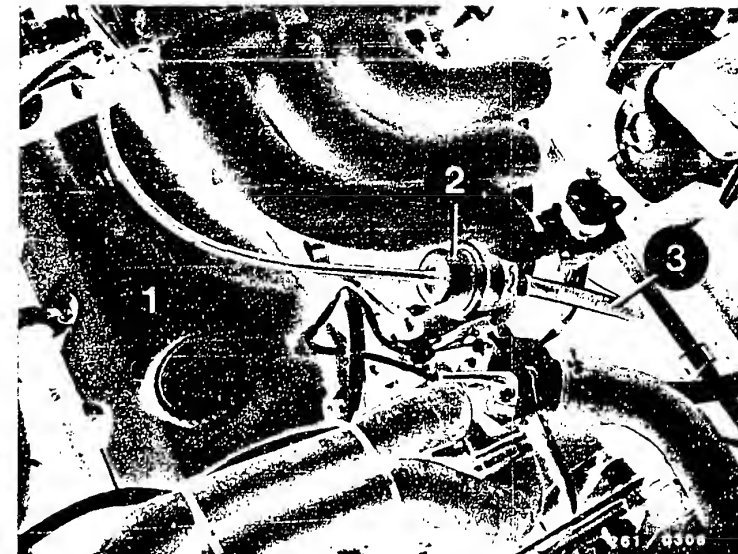
Listen: Disconnect plug from electric fuel pump.

Build up fuel pressure: On universal test adapter, set program switch "V" to position 17. Switch on ignition and press button T3. Pre-supply pump must operate. If not, check connecting leads and, if necessary, replace pre-supply pump.

yes

Continued on M7/M8

Continued on M7/M8



528e (6 and 7 series similar)

1=Air hose to intake manifold

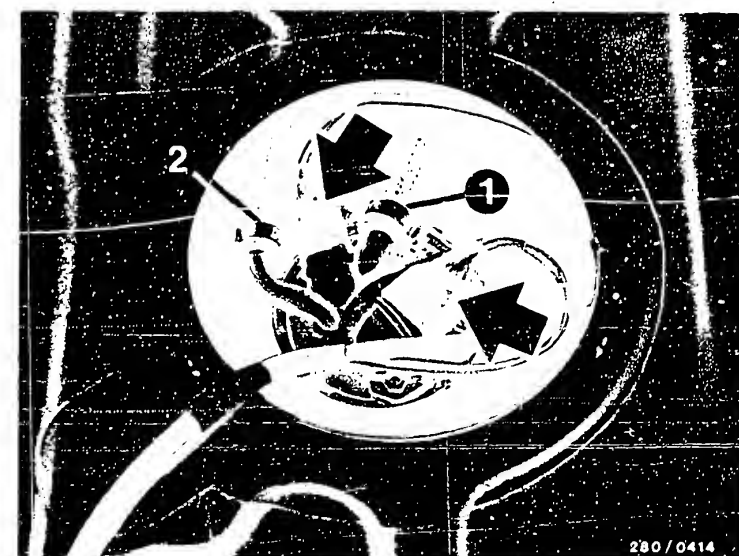
2=Pressure regulator

3=Return hose

1=Fuel delivery line

2=Fuel return line

Arrows=Plugs, 2-pin pre-supply pump, 3-pin immersion-tube sensor



**M5**

No maximum engine power

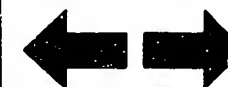
BMW 5, 6 and 7 series (USA, Japan)



**M6**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



Maximum engine power/top speed not reached (continued)

yes

Fuel pressure at full load  
O.K.?

no

- Fuel-pressure regulator defective - replace. If the fuel-pressure regulator is mounted on the fuel-distribution pipe with an O-ring, the O-ring and the flat ring must be replaced after removing the pressure regulator (use parts set 1 287 010 704).
- Fuel pump delivery insufficient - replace fuel pump.
- Strainer in tank clogged? Corrosion in tank?

Install pressure gauge on fuel-distribution pipe (delivery line).  
Caution:  
Catch escaping fuel.  
Fire hazard with hot engine and electric sparks.

Let engine idle:  
Fuel pump pressure approx. 2.0 bar.

Disconnect air hose to intake manifold on pressure regulator:  
Fuel pump pressure: 2.3...2.7 bar  
(reading may fluctuate slightly). Re-connect air hose. Check fuel pressure on chassis dynamometer at max. full-load speed and at rated power:

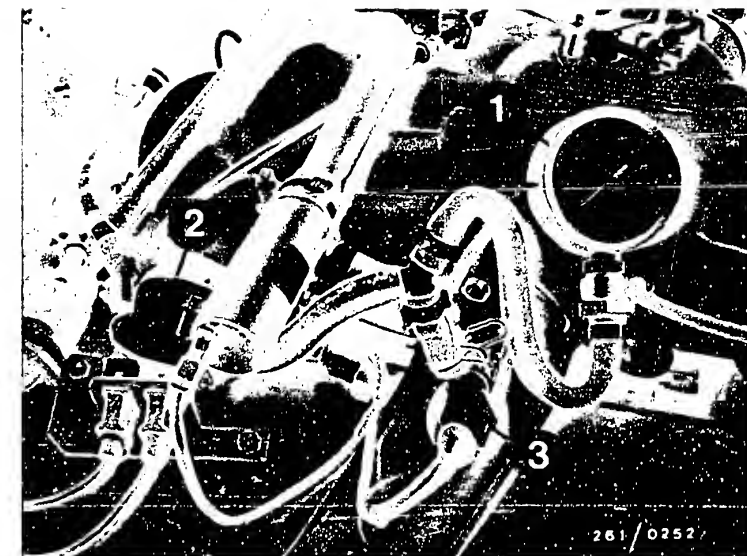
Fuel pressure at full load:  
2.3 ... 2.7 bar (reading may fluctuate slightly).

yes

yes

Continued on M11/M12

Continued on M9/M10



1=Pressure gauge  
2=Fuel-line-pressure damper in fuel delivery line  
3=Start valve

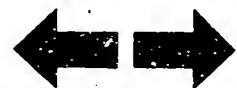
528e, 633CSi, 533i:

1=Fuel pump  
2=Fuel filter  
3=Fuel intake line  
4=Fuel delivery line  
Arrow=Direction of fuel flow



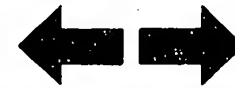
**M7**

No maximum engine power  
BMW 5, 6 and 7 series (USA, Japan)



**M8**

No maximum engine power  
BMW 5, 6 and 7 series (USA, Japan)

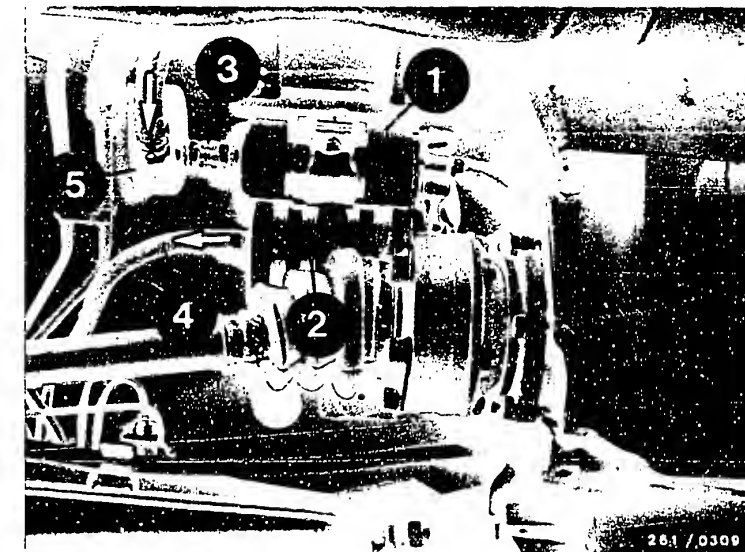


Maximum engine power/top speed not reached (continued)

yes

### Trouble-shooting

- Fuel filter clogged - replace.
- Voltage at fuel pump plugs, with engine running, min. 12 V. If not, clean contacts, possibly eliminate poor ground connection. Replace leads.
- Check pre-supply pump.  
Listen: Disconnect plug from electric fuel pump. Build up fuel pressure: On universal test adapter, set program switch "V" to position 17. Switch on ignition and press button T3. Pre-supply pump must operate. If not, check connecting leads and, if necessary, replace pre-supply pump.
- Fuel-pressure regulator defective - replace. The fuel-pressure regulator is mounted on the fuel-distribution pipe with two fastening screws and an O-ring. After removing the pressure regulator, replace the O-ring and the flat ring (use parts set 1 287 010 704).
- Fuel pump delivery insufficient - replace fuel pump.
- Strainer in tank clogged?  
Corrosion in tank?



733i:

1=Fuel pump

2=Fuel filter

3=Fuel intake line

4=Fuel delivery line

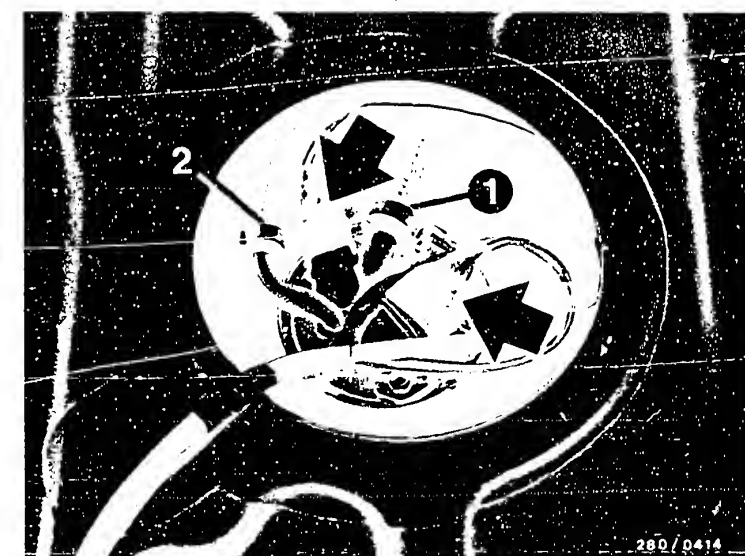
5=Fuel spinner

Arrow=Direction of fuel flow

1=Fuel delivery line

2=Fuel return line

Arrows=Plugs, 2-pin pre-supply pump,  
3-pin immersion-tube sensor



Continued on M11/M12

**M9**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



**M10**

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)





Maximum engine power/top speed not reached (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.  
Leak test:  
Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Testing completed for customer complaint

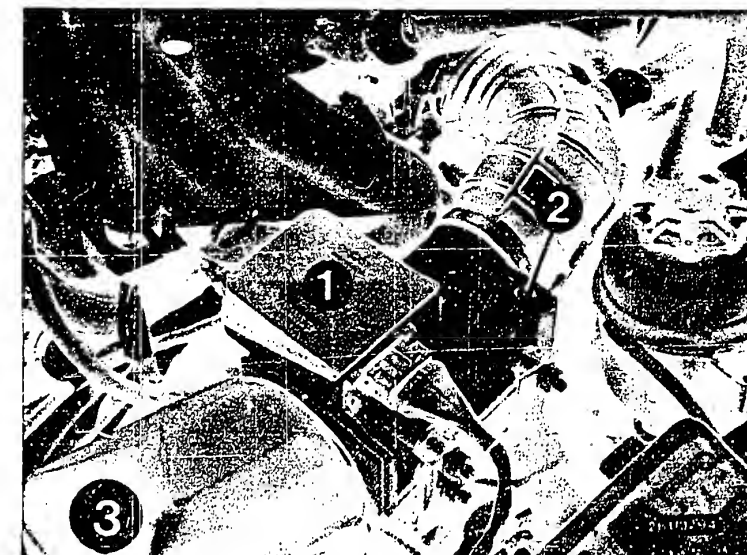
no

"No maximum engine power".

Customer complaint remedied?

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft, valve spring broken).



528e:

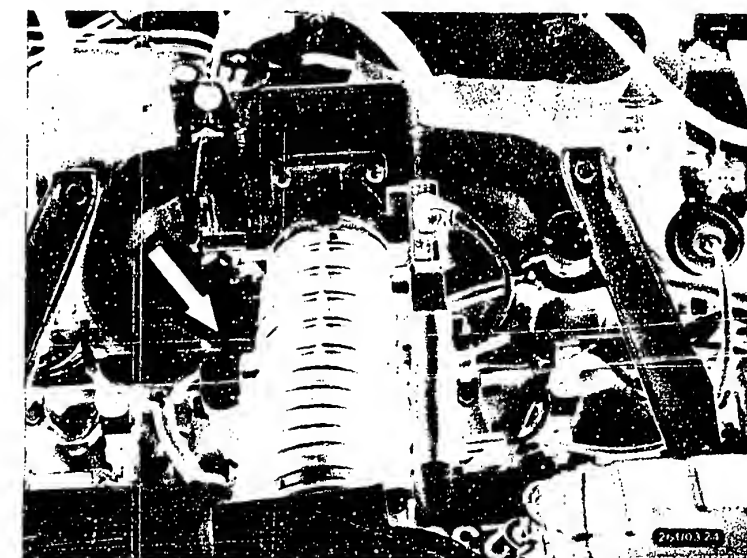
1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter

533i, 633CSi, 733i:

Arrow=Disconnect hose here for leak test.



M11

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)



M12

No maximum engine power

BMW 5, 6 and 7 series (USA, Japan)





## CO ADJUSTMENT AT IDLE TOO LOW OR TOO HIGH

### Trouble-shooting program according to customer complaint

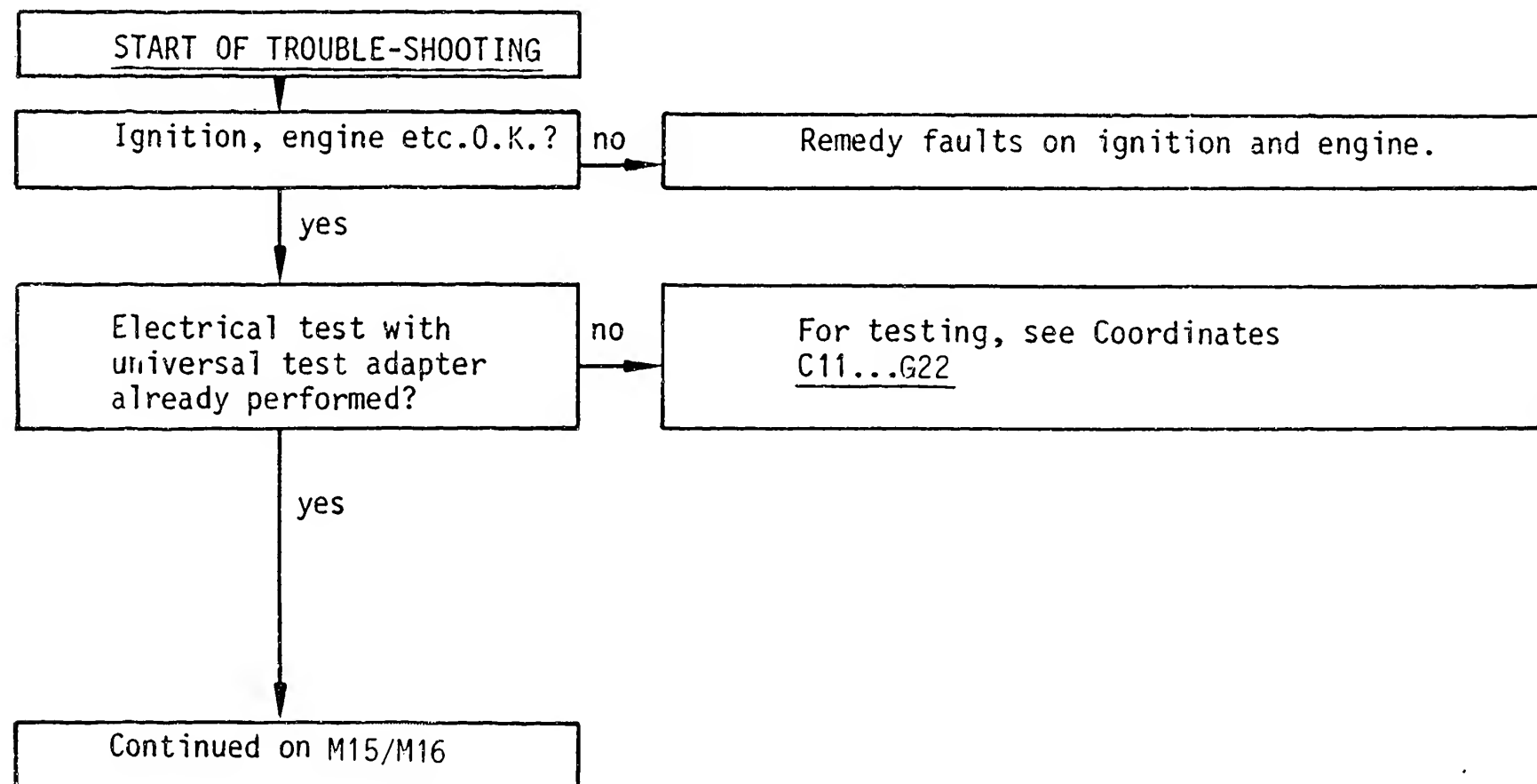
#### Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



**M13**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



**M14**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



# CO adjustment at idle too low or too high (continued)

yes

Check secondary pattern of all cylinders.  
Secondary pattern O.K.?

no

Check ignition coil and high-tension part:  
Distributor cap oil-fouled outside and inside?  
(Unscrew distributor rotor and check camshaft seal).

## Notes:

Fastening of distributor cap with 3 screws. To remove the distributor cap, it is necessary to remove the radiator cover.

Note the cylinder numbers when connecting the HT ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. 0  $\Omega$ ). Secondary resistance: 5 to 7.2 k $\Omega$ . Check interference-suppression resistors, HT ignition cables and spark plugs.

## Value of interference-suppression resistor in

Distributor rotor:	1 k $\Omega$
Distribution domes:	0 k $\Omega$
Spark-plug connectors:	5 k $\Omega$ each
Spark plugs	5 k $\Omega$
Ignition coil:	1 k $\Omega$
Shielded connectors on ignition coil and distributor cap	1 k $\Omega$ each

yes

Air-flow sensor O.K.?

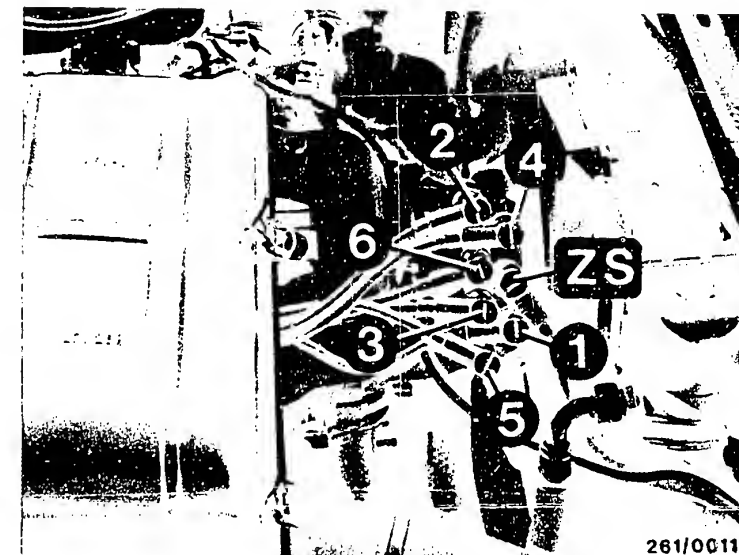
no

## Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Continued on M17/M18



## High-voltage distributor

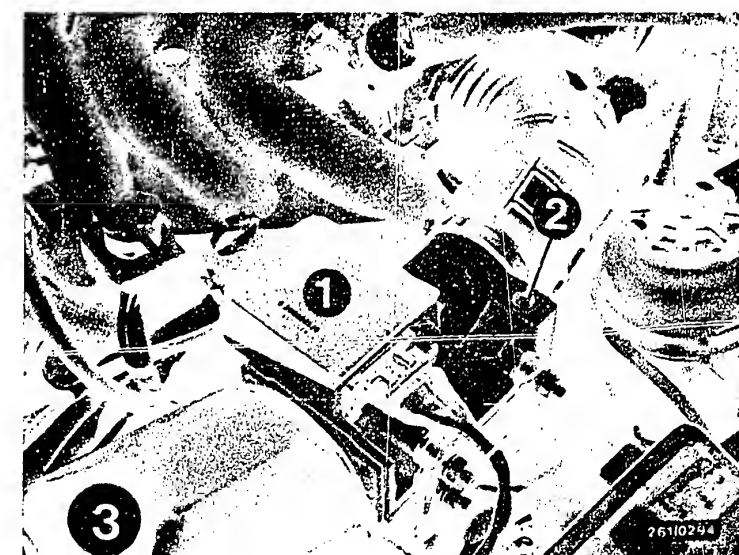
1 to 6=Cylinder numbers

ZS=High-tension lead to ignition coil

1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter



M15

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



M16

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



CO adjustment at idle too low or too high (continued)

yes

Start valve O.K.?  
(Leak test)

no

1. When installed

Pinch off fuel delivery line to start valve. If CO concentration then O.K., replace start valve.

2. When removed

Remove start valve (Caution: Fire hazard.) Fuel line and electric lead remain connected (place collector vessel under start valve).

Build up fuel pressure:

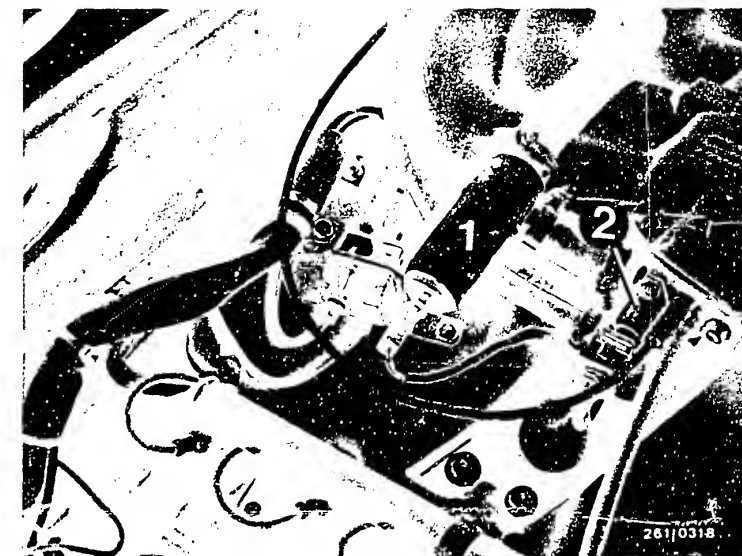
On universal test adapter, set program switch "V" to position 17.

Switch on ignition and press button T 3.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Continued on M19/M20



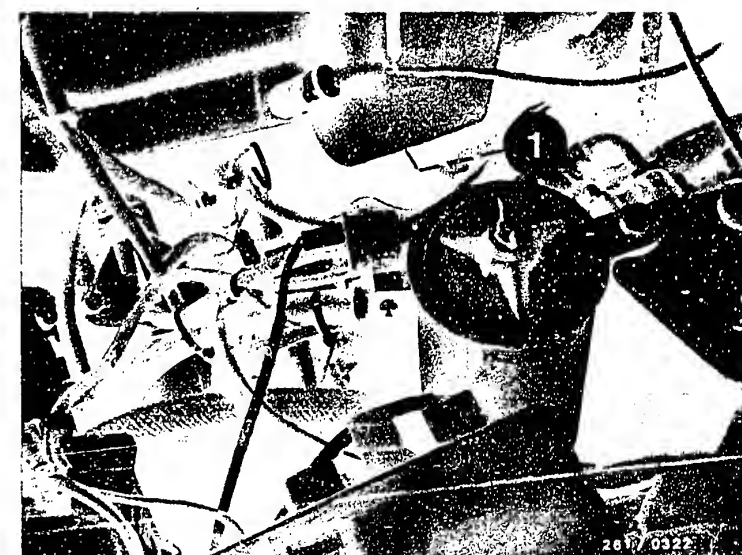
528e:

1=Idle actuator

2=Start valve

533i, 633CSi, 733i:

1=Start valve (at bottom on intake manifold)



**M17**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



**M18**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



CO adjustment at idle too low or too high (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

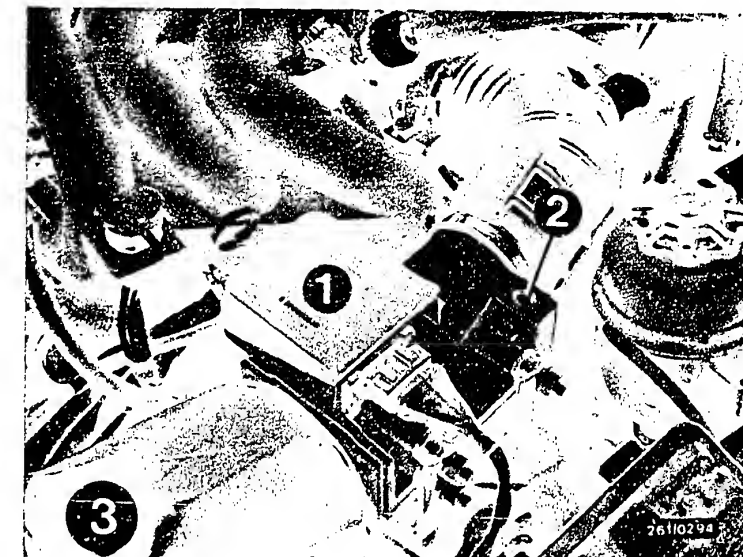
Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on M21/M22



528e:

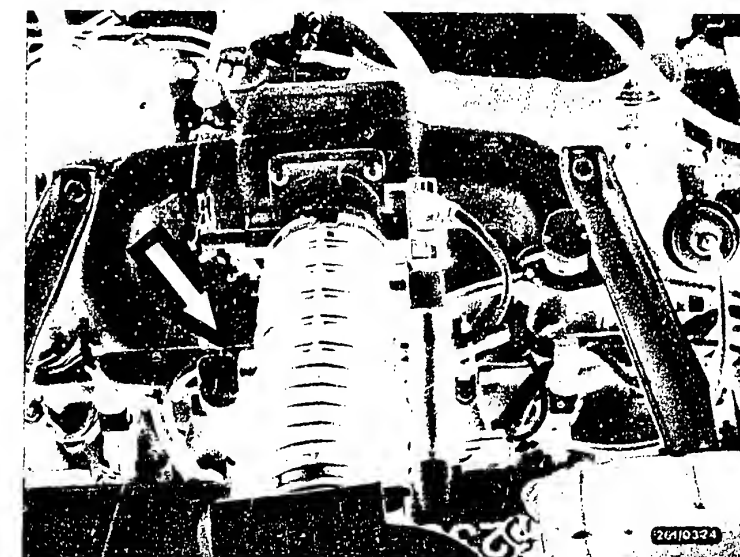
1=Air-flow sensor

2=Idle-mixture-adjusting screw

3=Air filter

533i, 633CSi, 733i:

Arrow=Disconnect hose here for leak test.



**M19**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



**M20**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



## CO adjustment at idle too low or too high (continued)

yes

Exhaust-gas test with CO analyzer with engine at operating temperature. Electrical devices switch off.  
Idle speed:  
650 ... 750 min<sup>-1</sup>

### Specification:

0.2...1.2 vol. % CO  
(measured before catalytic converter, lambda sensor plug connector taken apart and hose to carbon filter disconnected).

no

Remove plug in air-flow sensor using special tools.

- CO concentration too low:  
Turn bypass screw in air-flow sensor step by step in a clockwise direction (turn to the right).
- CO concentration too high:  
Turn bypass screw in air-flow sensor step by step in a counterclockwise direction (turn to the left).

After completing the adjustment, use new plug.

yes

Testing completed for customer complaint

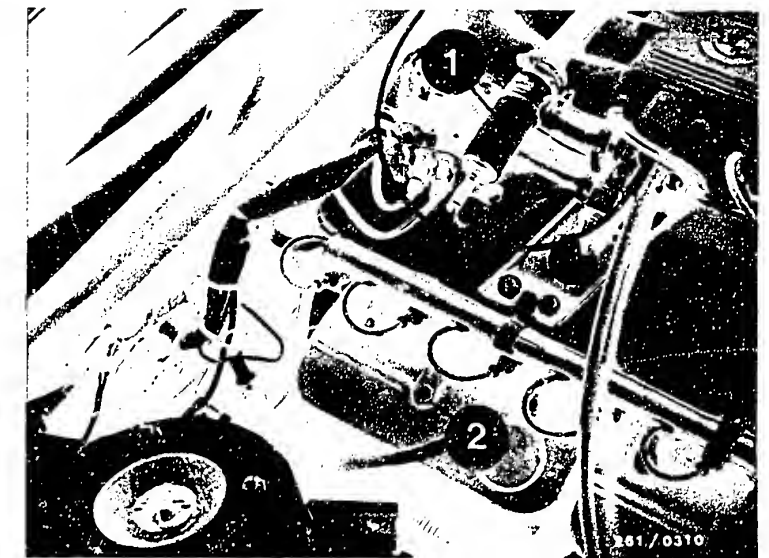
"CO adjustment at idle too low or too high"

Customer complaint remedied?

no

### Further possibilities:

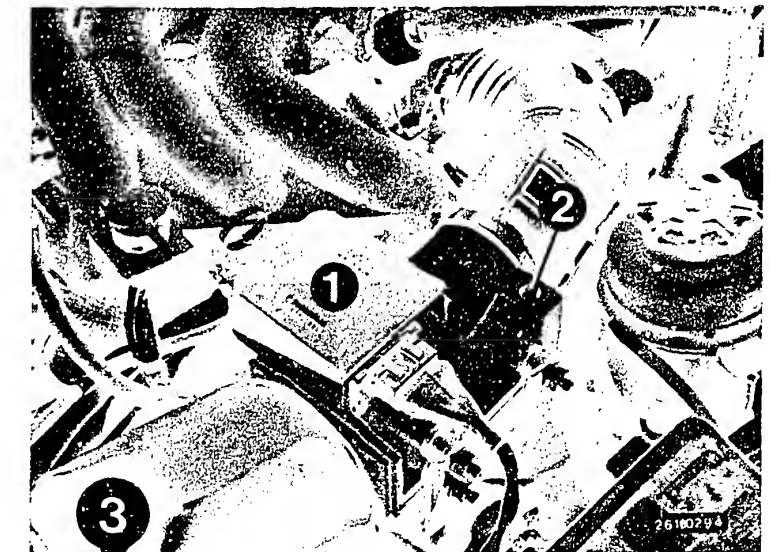
- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).



528e

1=Actuator for idle speed control  
2=CO test connection

1=Air-flow sensor  
2=Bypass screw  
3=Air filter



**M21**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



**M22**

CO adjustment

BMW 5, 6 and 7 series (USA, Japan)



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

13...39

VDT-I-261/102 En

6.1983

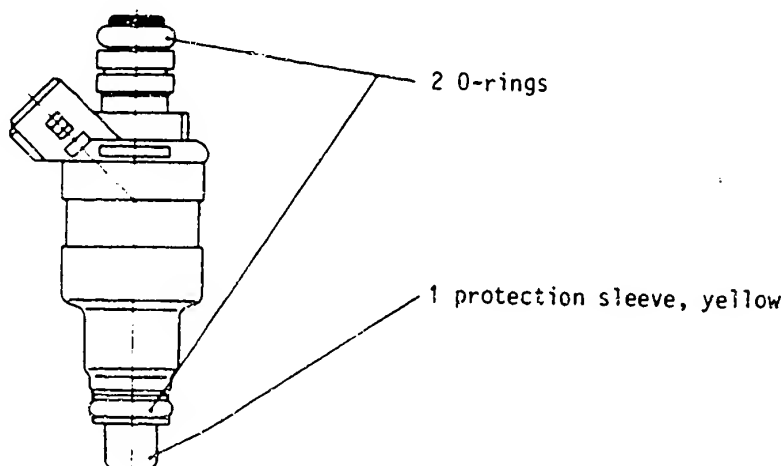
PARTS SET FOR SOLENOID-OPERATED INJECTION VALVES  
0 280 150 2..

Supersedes 8.1982 edition

AND PRESSURE REGULATORS 0 280 160 2..

A common parts set is available for the Motronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for pressure regulator:  
1 O-ring  
1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 764 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 under 0 280..).

Please direct questions and comments concerning the contents to our authorized representative in your country.

**BOSCH**

Gesellschaft für Kfz-Kundendienst, Kfz-Ausrüstung  
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**N1**

Technical Bulletin

BMW 5, 6 and 7 series (USA, Japan)





# Technical Bulletin

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28

PLUG CONNECTORS FOR  
JETRONIC COMPONENTS  
Parts sets

VDT-I-280/111 En

11.1984

(supersedes edition 11.1982)

Parts sets are available for replacement of Jetronic plug connectors. These consist of:

- Plug connector housing
- Protective cap (rubber sleeve)
- Contact springs

These parts are listed on microfiche EE...\*.

\* see microfiche EE00 under 0 280 ..

- Plug, black, 2-pin,  
parts set 1 287 013 002 cable connector in conjunction with socket, 2-pin
- Socket, black, 2-pin,  
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- Socket, grey, 2-pin  
parts set 1 287 013 003 for:

Solenoid-operated injection valve	0 280 150 ..
--------------------------------------	--------------



**N2**

Technical Bulletin

BMW 5, 6 and 7 series (USA, Japan)



- Socket, black, 3-pin,  
parts set 1 237 000 039 for:  
Throttle-valve switch 0 280 120 ..
- Socket, black, 5-pin,  
parts set 1 287 013 006 for:  
Air-flow sensor 0 280 20. ..  
(LE version)
- Socket, black, 6-pin,  
parts set 1 287 013 004 for  
Air-flow sensor 0 280 200 ..
- Socket, black, 7-pin,  
parts set 1 287 013 005 for:  
Air-flow sensor 0 280 20. ..  
Air-mass sensor 0 280 211 ..
- Wiring-harness plug connector, black, 25-pin  
parts set 1 287 013 009 for:  
Control unit 0 280 0..
- Wiring-harness plug connector, black, 35-pin,  
parts set 1 287 013 008 for:  
Control unit 0 280 0..

The contact springs (minitimers) are also available separately under part no. 1 284 477 026.

The plug-connector housings are only available in the stated colours.

Responsible:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.



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